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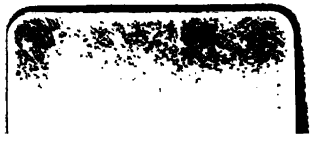

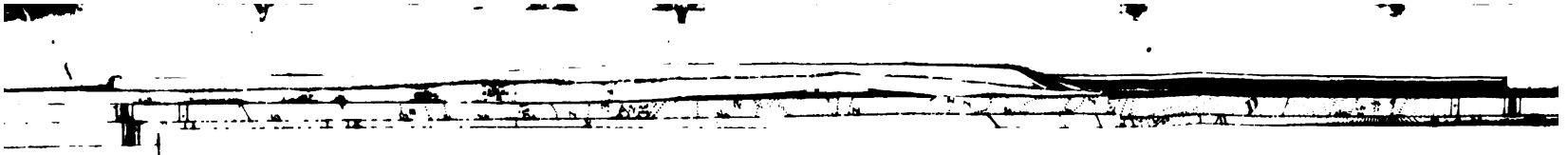

UNDER SANCTION

OF

THE RIGHT HONOURABLE LORDS COMMISSIONERS

OF THE

ADMIRALTY.

SAILING DIRECTIONS

FROM

POINT LYNAS TO LIVERPOOL

WITH

Charts. Coast-views. River-Sections.

TIDAL COURSES AND TIDE GAUGE TABLE,

for navigating the

DEE AND MERSEY

including

The latest Alterations

by

COMMANDER

H. M. DENHAM. R.N.

F.R.S.

Appearance of Liverpool when rounding the Rock Light house.

Printed & Published as the Act Directs for H.M. Denham, by J. & J. Mawdsley, Liverpool 1840.

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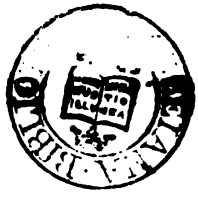
and by all Chart Sellers at the Sea Ports of the United Kingdom.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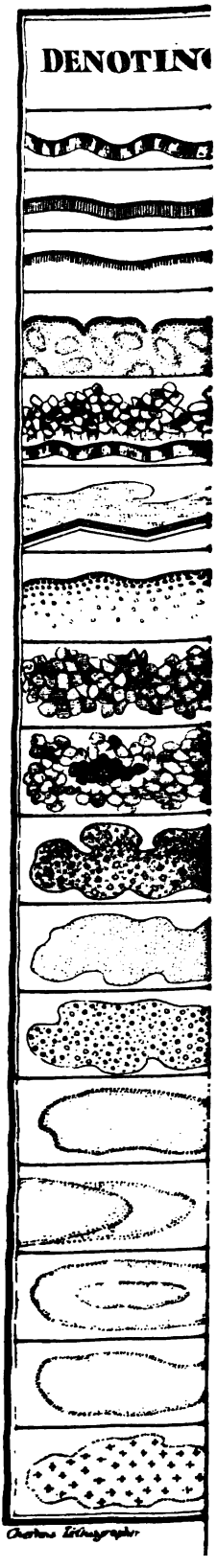
DENOTIN

PREFACE.

THE Survey from which this volume emanates was undertaken in 1833, by order of the Right Honourable Lords Commissioners of the Admiralty. The local concern and doubts at that date respecting the actual state of the navigation into Liverpool, gave rise to memorable speculations on the other side of the Mersey, and were sufficiently argued by the authorities to cause an Admiralty order for my proceeding direct from the Bristol Channel, just then finished, without attending to the intermediate range of coast. The result of the first six months of the survey set every speculation or doubt at *rest*. The New Channel was forthwith lighted and beaconed. The Survey was published as it proceeded, by permission of their lordships, on its working scale of four inches to the mile; the local intercourse of 13,000 sail of vessels was thus provided for at all hours of the tide, *night or day*, hitherto shut out for four hours of every twelve. The 261 cases per annum of Mail-boat delay, in starting for and arriving from Dublin, soon diminished, whilst a progressive increase of local tonnage from 1,500,000 to 2,000,000 per annum followed. But as each year, up to 1839, produced some addition to, or change in, the order of beaconage,

according as I detected the immediate necessity, the Admiralty Hydrographer, Captain Beaufort, most considerately admitted the inducement of withholding my Remarks and Sailing Directions until the great change which I predicted in June, 1838, [*vide Report in Appendix,*] should be defined, and, if possible, eventually *provided* for. My Report of October 4th following, [*vide page* 30, *and Appendix,*] not only *defined* and proposed a remedy, but unhappily had to suggest an *interdiction* as to low-water intercourse, until that proposition should be worked out.

The necessity of *interdicting* night intercourse with the port was an argument (however reluctantly received) irresistable, that *something* ought to be done to avert the further apprehension I entertained of even the existing gutter-way through the original bar silting up before another passage could be opened, *unless* the most prompt and vigorous efforts were made. With such means as were conceded, I set to work, undertaking to *force* and open another line of entrance into the body of *the identical* New Channel, which still preserved its depth and essential feature up the *inner* two-thirds. The months of November and December, 1838, were dedicated, through all turbulence and rigour of season; and so much effected as to justify the *proposition of at once* erecting a Lighthouse on Crosby Shore, to come into action *by the April following*, in which month I

guaranteed the new passage to be ready, and thus restore the LOW-WATER intercourse to steamers and coasting craft, whilst the homeward voyagers, at the *fall of the year*, could *receive the announcement*, and be *prepared for* the great change of *course* into the New Channel. Her Majesty's Mail-packets to Ireland had relapsed into the tidal detentions of 1832-33, *i.e.* not proceeding out of the Mersey on spring tides for two hours after the mail had been put on board, nor getting into port for the like time after arriving in the bay from Dublin: their hour of starting was, however, altered from 5 to 8 o'clock; the former hour brought them always at the bar by *low-water springs;* the latter hour ensures, at the least, from 5 to 10 feet lift of tide in all the avenues, though entailing darkness six months of the year on *departing* mails. From reasons over which I had no control, the progress of my plan underwent all the hazards (and disappointment in dated completion) of three months' cessation; happily, however, for the credit of my humble judgment, and the vast interests at stake, the *first* progress was superior to hazarded *reaction;* and though the new *bearing-line* into the port was left for a *winter's* adaption, instead of summer, *yet there it is*, as announced on the 10th of October, 1839; and if not so deep as intended and to be desired, *may* be rendered so by perseverance, under proper appropriation of local funds.

That the tidal capacity and consequent navigable character of Liverpool should again be identified with my surveys and propositions, and that too in averting its choking up into a *half-tide* harbour, would be ample requital; but that the simple object I proposed of continuing the accustomed New Channel facility by another entrance, should be denominated a *distinct channel*, and locally distinguished as the 'VICTORIA CHANNEL'; reverts to (in the most flattering way, and which I trust I shall continue to appreciate and treasure) the gratulating spirit which pervaded when noticing my humble services as annexed,* and which were graciously recognised and honourably recorded at the Admiralty.† Six years' un-

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* "TOWN-HALL, *3rd July*, 1834.

"DEAR SIR,—I have great pleasure in acquainting you that the Common Council were pleased, at their meeting yesterday, unanimously, to present the Freedom of this Borough to you, in testimony of the high sense entertained by the Council of the valuable services rendered by you to the Port of Liverpool, by your gratuitous, but most important assistance, rendered to the Survey of the Entrance to the Harbour; and I shall be happy to attend to administer the requisite oath, whenever it may suit your convenience.

"I am, dear Sir,

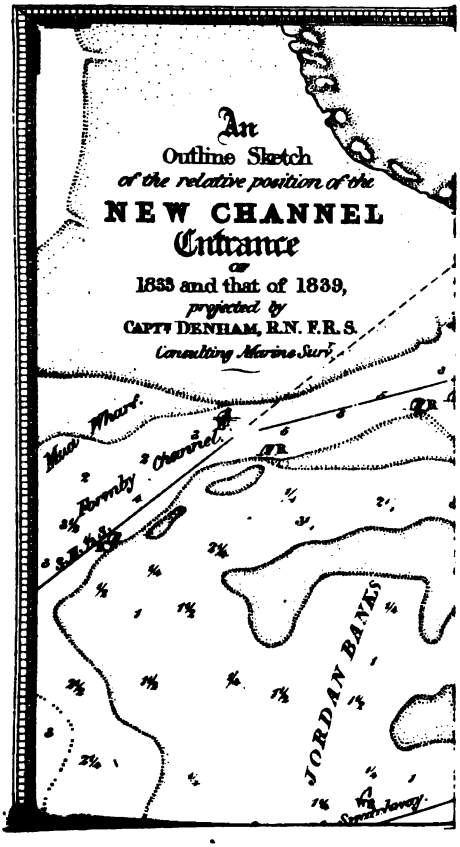
"Your very obedient Servant,

"JOHN WRIGHT, Mayor.

"Lieut. DENHAM, R.N."

"*July 2nd*, 1834.

"MY LORDS,—The Committee for the Affairs of the Estate of the Trustees of Liverpool, unanimously requested me to express to your Lordships the high sense they entertain of the valuable services rendered to this port by Lieutenant DENHAM, R.N. in perfecting so excellent a Chart of its approaches, in his accurate Survey of the New Channel, and the very great attention he has paid in assisting to place the necessary Lights, Buoys, and Marks; in the performance


An
Outline Sketch
of the relative position of the
NEW CHANNEL
Entrance
of
1833 and that of 1839,
projected by
CAPTN DENHAM, R.N. F.R.S.
Consulting Marine Surv.
Mud Wharf
Channel
Bromby
JORDAN BANKS
Sandy Island

remitting local attention to sextant and leadline is enough to warrant the directions and comments contained in this volume. But the fruit of that experience would not be

---

of which arduous and important duties he has shown equal skill and accuracy, united with unremitting application and perseverance.

"The Committee think it only due to Lieutenant Denham that they should thus bear testimony to his merits, which they have the further pleasure of informing you have this day been acknowledged, by the Common Council of this town presenting him with the Freedom of the Borough.

"I have the honour to be, my Lords, &c. &c.

(Signed) "CHAS. LAWRENCE, Chairman.

"*To the Right Honourable*
The Lords Commissioners of the Admiralty."

"Lieut. DENHAM's Survey bearing evident marks of the labour, scientific ability, and attention exercised in its progress and completion; the Committee think it due to him and his coadjutors (Lieut. Robinson and Mr. Bedford), to the public and to themselves, to make these statements; and they have now only to congratulate the shipping interests of this great commercial port in possessing a Chart of its intricate entrances, which can be relied upon with perfect confidence, but more particularly in the clear illustration of the approach to Liverpool by the *New Channel;* whereby there can be no doubt, that, in addition to the facility of ingress and egress at almost all times of the tide, the risk of life and property will be very materially diminished.

(Signed) "JOHN WRIGHT, Mayor,
.. "CHARLES HORSFALL,
.. "JOHN TOBIN,
.. "WILLIAM RIPLEY,
.. "WILLIAM SMITH,
.. "WILLIAM POTTER,
.. "THOMAS LEATHOM,
} Members of the Dock Committee.

"*October* 21*st*, 1834."

[NOTE.—*This was after the Corporation had accompanied me throughout the navigation.* *H. M. D.*]

"TOWN-HALL, LIVERPOOL, *March* 5, 1835.

"MY LORD,—I am requested by the Common Council of this town to address your Lordship on the subject of a Chart of the Mersey, &c. * * *

dispensed as it ought—particularly as much deference has been paid to my last suggestions respecting port equipments and avenue improvement—were I to close these remarks without disturbing the wonted satisfaction and security which present possession of an eleven-feet low-water outlet might indulge. I therefore entreat a community, whose whole investment in commerce depends on the simple but vital issue of the mighty workings of Nature,—referred to in detail, and plans and sections in the Appendix of this work,—to be

---

being now completed. The indefatigable exertions and laborious efforts of Lieut. DENHAM and his coadjutors, have elicited the warmest acknowledgments from all those public bodies in this town who have been cognizant of them, &c. * * * I am desired further to make application to your Lordship, that the Council may be favoured with a copy of the Chart on its present scale, it being their wish to preserve it with other muniments of this Corporation.

"I have the honour to be, my Lord, &c.

(Signed) "JAMES ASPINALL, Mayor.

"*To the First Lord of the Admiralty.*"

---

† "ADMIRALTY, 20*th March*, 1835.

"SIR,—My Lords Commissioners of the Admiralty having taken into their consideration your meritorious services in the various Surveys on which you have been employed, and appreciating highly the talent which you have displayed, and having a high sense also of the advantage accruing to the public from the completion of the Survey of the Port and Harbour of Liverpool and the neighbouring Coast, their Lordships command me to acquaint you that they have been pleased, as an especial mark of their approbation, to sign a Commission, promoting you to the rank of Commander in the Royal Navy.

"I am, Sir,

"Your very humble Servant,

"GEORGE DAWSON.

"Lieutenant HENRY MANGLES DENHAM,

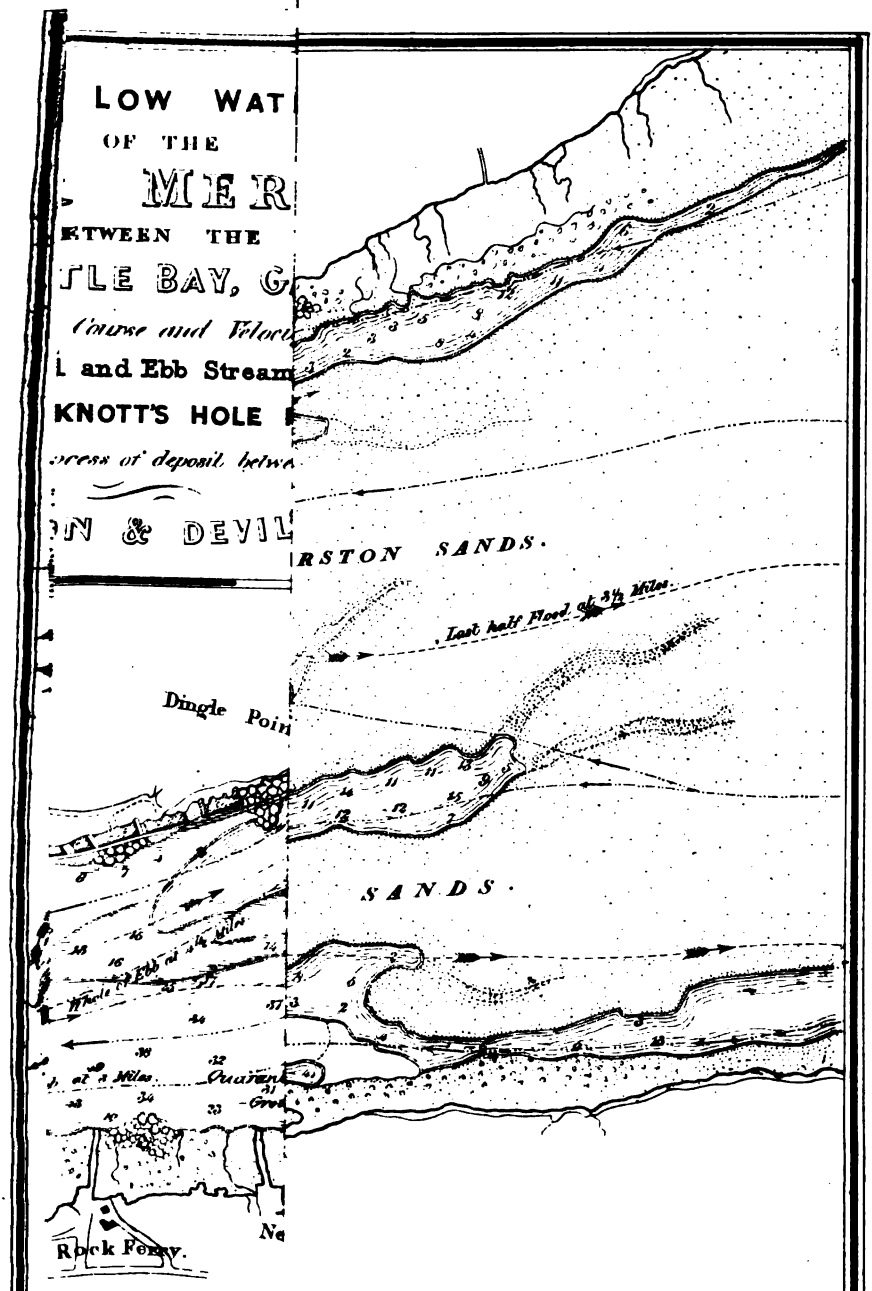
"73, Pall Mall."

watchful. It will not do to be lured by docks and warehouses; they will *accommodate* your shipping, but vigilance, and incessant dedication of means can alone preserve an avenue with the ocean for *their intercourse.* The New Cut lies in a fairer trend of tide than any channel since 1814; but recollect, like that by-gone 'South Channel,' the 'New Cut' lies ten miles seaward of your docks; consider the enormous deposit the Mersey is charged with—[*vide Appendix*]. In a word, *constant* harrowing, not only of the New Cut, but the protruding elbow of the NORTH-EAST ELBOW OF BURBO, a distinct bank in 1836, called 'West Middle,' but now connected with Burbo, is imperative. Spurts of zeal and occasional lavishment of money will not do, but at the cost of intervening *checks* upon the intercourse. A steady and liberal appropriation can alone sustain, for a time, the naturally languishing (because becoming more and more remote) gutter-escapes of the Mersey at all subservient to the purposes of the second emporium of the Kingdom, until that undertaking, which I only wait seasonable opportunity for introducing, shall at once obviate intricacy, distance, tidal limit, and risks; whilst reducing the beaconage to twelve buoys instead of sixty, and three lights instead of nine. Nor is it *seaward* alone that the mind's eye of a spirited and confiding community must be invited; on the contrary, there exists

cause, off and *connected with their very docks,* claiming occular conviction, and *demand* for averting means. By *many* I shall be anticipated; but as I have been asked by *some,* is there really such a bank as Pluckington? I am constrained here to refer those interested in the docking of ships, to study for a few minutes the plans and sections in Appendix of PLUCKINGTON and *Devil's Bank.* Most assuredly, if those baneful accumulations are not diminished or arrested, docks and Dublin packet-facility must be looked to on the bolder and more sheltered Cheshire shore, even though the proprietary of the frontage be secured by the Liverpool authorities.

In the body of this Work and Appendix, I propose, in detail, several aids to the present maritime safety; the chief of which are briefly noticed here for the attention of those of local influence who may see reason for *urging them:—*

A *permanent Steamer* for *instant need,* (January 7, 8, 9, 1839!) as well as for constant harrowing—a Floating Depôt of buoys and moorings at the sheltered side of the river—*screw-pile* LIGHTHOUSES on spits, instead of light-vessels—*screw-pile Beacons* instead of spit buoys —*screw-pile* REFUGE-FABRICS for the shipwrecked, with means of showing a lantern, and containing restoratives, on West Hoyle, East Hoyle, Burbo Bank, Mad Wharf, and Formby Bank—*screw moorings* in the river, between Rock Lighthouse and Sloyne—*duplicate Light-ship* in



Engr.d 9, Southampton Buildings, Ho

M. Denham by J. &

Hoylake—a *rocket* every two hours from N.W. Lightship, and *blue-light* every hour—a *Telegraph* on Crosby Point—a *subsidiary light* for the Crosby Channel* and Rock Channel—the present line of sea-lights, Bidston and Leasowe, leading *over* the margins of Horse Channel—Leasowe Lighthouse should be superseded by one upon Dove-point Sandhills, 1630 yards westward; and a screw-pile Lighthouse erected upon the low-water spit of Dove; so as to afford a *single clearing-line* up Horse Channel; alike presenting a desirable facility to the Rock Channel, especially if the *Refuge* Beacon on East Hoyle is judiciously placed in concert: Hoylake entrance also much assisted: Bidston Light, of course, discontinued†—*constant dredging* at north-east elbow of Burbo (West Middle Bank); and simultaneous *harrowing* in the 'New Cut' of 1839; also between Beggar's Patch and North Bank, in Rock Channel [*vide Declension, page* 81]—a self-registering *Tide-gauge* at the north end of docks—an *Observatory* [*vide Report in Appendix*] —lightning conductors, for lighthouses and light-vessels [*vide Report in Appendix*]—and taking the dock mud elsewhere, instead of casting it into the river abreast of the docks [*vide Report, page* 32, *and Appendix*].

HENRY MANGLES DENHAM.

60, *Pall Mall, London.*

* When of course the Formby Light-vessel (so long as retained instead of a *Lighthouse* on Taylor's Bank) must be distinguished by *two* lights.

† These suggestions, of course, contingent upon the *present* state of the navigation.

A SUMMARY
OF
PERIODICAL WORKINGS OF THE MERSEY,

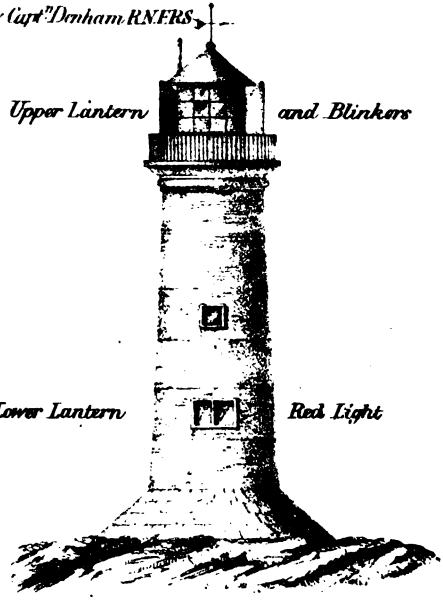
To aid the entreaty, 'BE WATCHFUL', *in Preface.*

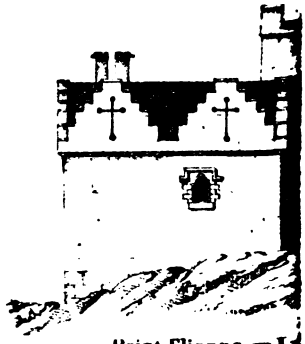
THE Devil's Bank and Pluckington Shelf are treated of under a distinct head in reference to invading the docks.—*Vide Appendix.*

The Quarantine Ground, however, (between Birkenhead and Brombro, and westward of Devil's Bank,) presents the following proof of the transitory and sportive nature of the Mersey sand-banks *within* the estuary's orifice. The mooring-ground of the Lazarets shoaled up in six years 22 feet; then, in the following two years, 11 feet more, or 33 feet in eight years, though nearly in two-fold ratio the last two years of the eight. This shoaling up remained stationary for four years, when it was observed to deepen again simultaneously with the Devil's Spit and Pluckington Shelf uniting, and the Swatchway opening through the upper part of Devil's Bank opposite Garston. The water rapidly deepened to its original depth; moorings, which had been sanded and considered lost since 1829, were recovered in 1835. Thus a deposit and self-removal of 2,284,880 cubic yards of sand was manifest in thirteen years, over one-third of a mile area, by tidal action alone. Did it merely elongate towards, and deposit in, the deep ravine of rock which forms the trough of the Mersey between the docks and Cheshire shore? No: for there the 60-feet depth at low-water springs continued and remains to this date. But let us see what the increase of the banks *outside* the estuary orifice amounted to in the thirteen years, from this and other ceaseless contributions. The straight-forward *sea-reach* of CROSBY diminished its water off *Bootle* 4 feet in 53; off *Seaforth* 1 foot in 45; off *Waterloo* 4 feet in 42; off *Crosby Point* 2 feet in 37; whilst the summary of banks' and shoals' increase stands thus: the south-east part of *Burbo* advanced into Crosby Channel 200 yards, and grew up 3 feet; the east elbow of Burbo advanced a quarter of a mile, and grew up 10 feet; the northern patch of Burbo advanced two-thirds of a mile, and grew up 10 feet; *Middle Bank* and Taylor's Spit advanced half a mile, and grew up 6 feet; the Jordan Flats spread half a mile to the westward, and grew up 3 feet; the *Newcome Knowl* and Three-fathom Spits formed and spread one mile and a half, growing up 6 and 12 feet; the *Beggar's Patch,* in Rock Channel, elongated 660 yards, and grew up 5 feet; the channel between it and North Bank narrowed one-eighth of a mile, and shoaled 8 feet; the *North Spit* elongated 660 yards, and grew up 5 feet; the Dove Spit advanced half a mile into the Rock Channel entrance, retaining its height; the north-east elbow of *East Hoyle* Bank protruded into the Horse Channel 200 yards, *over-lapping* the line of sea lights.

H. M. D.

Elet. Mersey by Capt. Denham R.N.F.R.S.



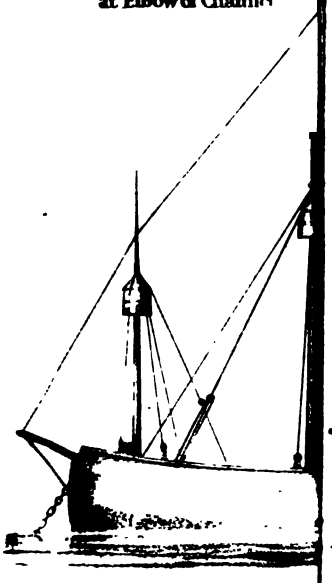


Point Elian's or L
N.E. Pt. of

Point of Air Lighthouse, Mouth of Dee, Flintshire. *(painted red & white horizontally).*

Beacon Buoy
at Elbow of Channel

New Channel Floating Beacon.
(Bell.)
off New Cut



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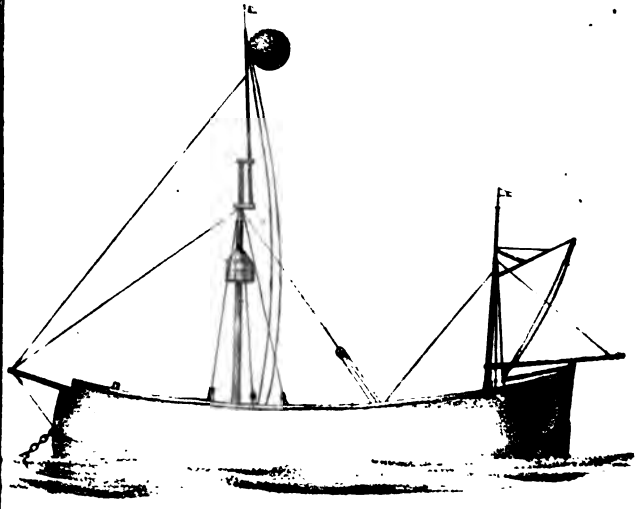
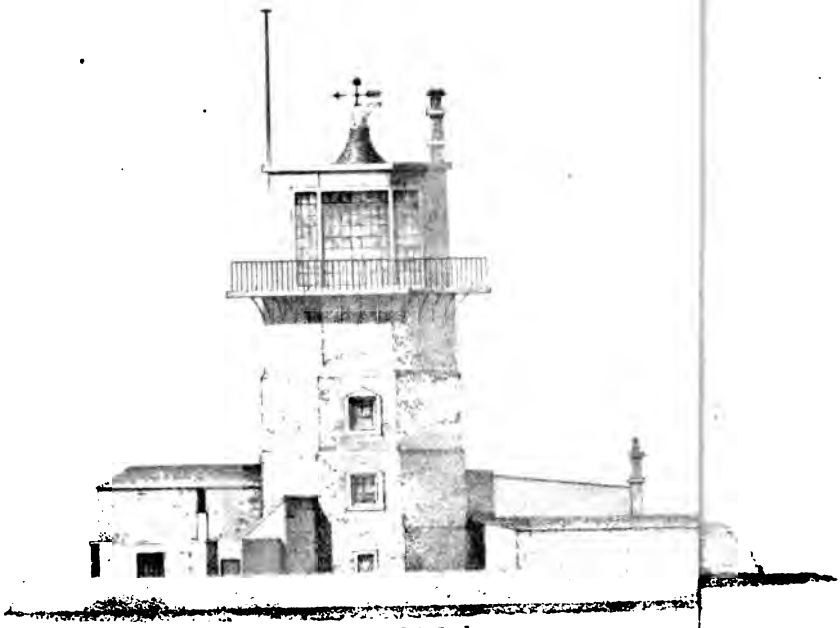
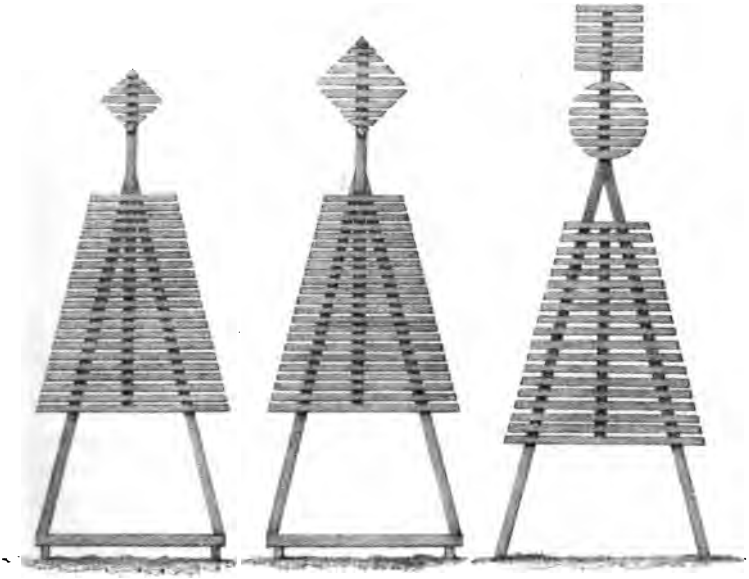


Formby Light Vessel.

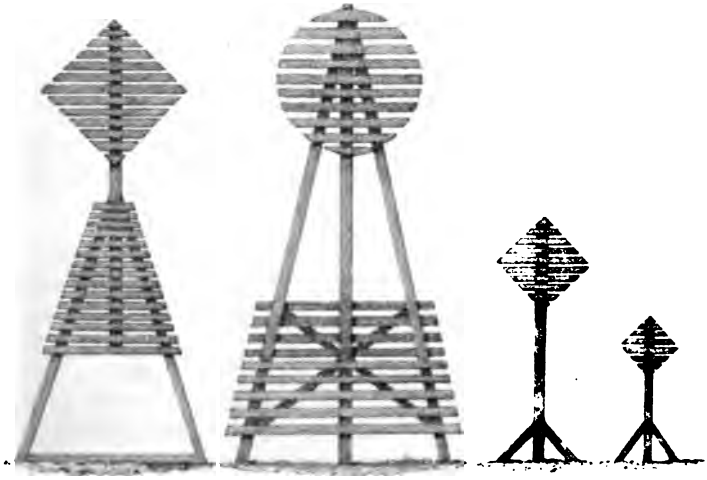


Bidston Lighthouse.

Leasowe Lighthouse



Helbre Marks. N.W. Formby Mark.



Walton Mark. New Chann.l Mark. Dove Marks.

for checking Light Vessel Station.

Published as the Act Directs for H.M. Denham, by J. & J. Mawdsley, Liverpool.

Chaffers, Lithographer

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ERRATA.

Page 18, line 19, for 8 miles *East*, read 8 miles *North*.

58, first line of third marginal note, for *conveying*, read *converging*.

80, line 2, for view *L*, read view *E*.

109, line 22, for bearing *South*, read bearing *North*.

114, first line of third marginal note, for *coasters* branch, read *eastern* branch.

INTRODUCTORY REMARKS.

ALL *Bearings* in this Work are expressed by *Compass*,—the magnetic variation *allowed* being 26 degrees westerly. All *Distances* given are in Nautic miles of 6085 feet to the mile. The Soundings are adjusted to low-water ordinary Spring-tides.

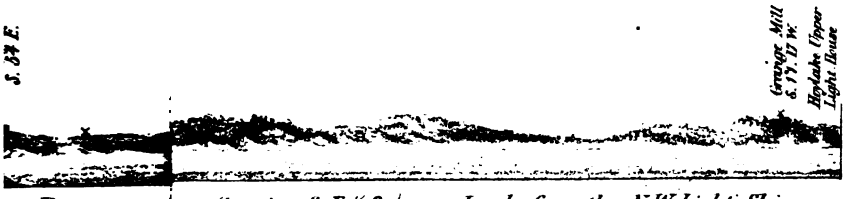
TIDAL STREAM.—The following abstract of a series of tests should be considered on approaching Liverpool Bay:—At a 9-mile offing N. of the high land over 'Point of Air,' Flintshire, in 10 fathoms water, (sand and shells), both Flood and Ebb set direct to and from the New Channel E. by S. and W. by N. at 2¼ knots on Springs and 1 knot upon Neaps; the *flood*-stream ceasing 20 minutes *earlier*, and the *ebb* draining 30 minutes *later* than the time of *rising* or *falling* upon the contiguous shore. This *Mersey-influence* upon the stream predominates whilst your off-shore distance is not less than five miles, nor your soundings less than six fathoms. When, however, you have advanced Eastward, so as to bring Formby Point S.E. at 5 miles distance and 6 or 7 fathoms (muddy bottom), act so as to avert the *Ribble* indraught, which here sets East, at the rate of 2¾ knots on springs, and 1½ upon neaps; the stream slacking 1 hour before it is high-water at Liverpool docks. The masking Crosby Light at night indicates your being in the Ribble influence. It is most important in thick weather, that if bound to Liverpool, you do not shoal your water below 4 fathoms, whilst running or turning up between Ormshead and the Eastern high shoulder of Flintshire forming the Dee entrance, or you will risk being entangled with the Chester Flats and West Hoyle Spit, under the influence of the Dee indraught, particularly from low-water to half-flood drawing S.E.

SHIPPING PILOTS.—It would much facilitate this operation, and not only save immediate valuable time to both parties, but, in cases of boisterous weather, *secure* the pilot boarding before *nightfall* separates boat and ship (to the cutting off, perhaps of even leading-in), if the following hints were attended to. You observe a Liverpool Pilot-boat (described page 4); if her Blue Peter is flying, she has disposable pilots—your pilot jack is up and *clear to view*;—take notice on which side the pilot-boat's *fenders* are; that tells you which she intends to board you upon—brace your after yards by, so as to *reduce* way, but not to stop it;—if, as she nears you, her flag is lowered, the Master-pilot considers you have too much way—brace by your head yards; understanding he is satisfied when his flag is close up again. It may happen, however, that he perceives you drawing into shoal water, or there may be some advantage in your being on the other tack; this will be indicated by his shifting fenders over to the other side; when you should act accordingly, by wearing or tacking. *H. M. D.*

View A. *Appearance of Formby S.E. Mark*

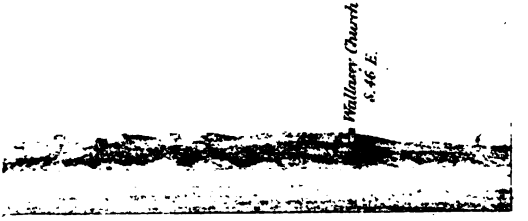
Vie

View C. *Appearance of Liverpool when running up the Burb*

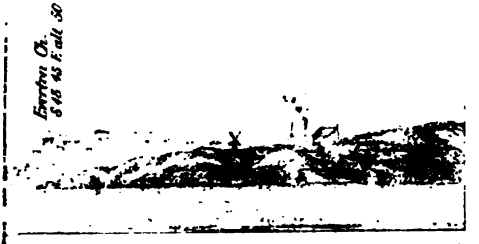


ew D. *Appearance (bearing S.E. ½ S.) — Leads from the N.W. Light Ship up*

E. *Appearance up the Rock Channel.*



— Leading up the Rock Channel Northward of



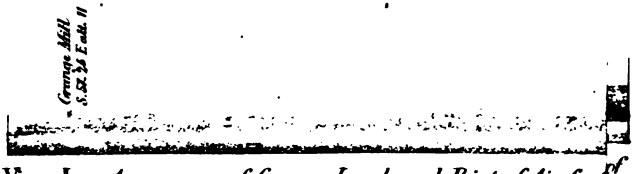
between the two shore Marks (bearing E.S.E.)

H

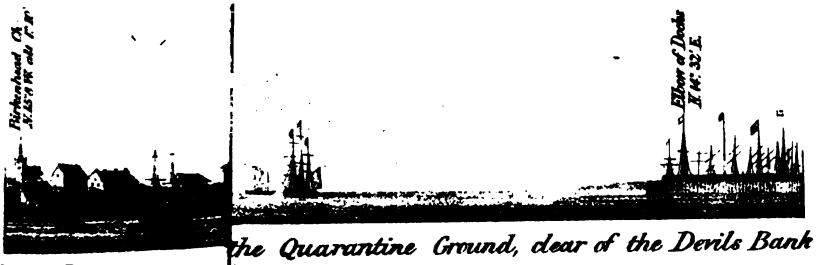
View H. *Appearance of Bidston and contiguous feature with Bidston*

View J. *Appearance of*

View K



View L. *Appearance of Grange Land and Point of Air feat*

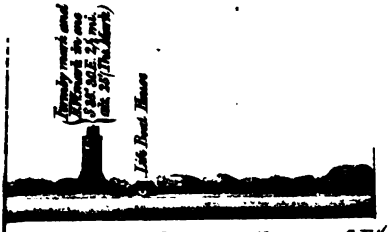


the Quarantine Ground, clear of the Devils Bank

View M.. *Appearance, E.)*

f Devils Bank

.)



W. Land mark in one (bearing S.E.½S.

10

Appearance of Point Lynas and its Lighthouse when nearing it from the Westward.

POINT LYNAS.

ALTHOUGH the Chart, which these remarks and directions are intended to accompany, does not begin further westward than abreast of the *Voryd River*, or eleven miles westward of the N.W. Lightship; yet, as *Point Lynas* is the western station of the Liverpool pilots—is distinguished by a lighthouse, and adjacent telegraph, supported by the Dock Trust of Liverpool, and is the accustomed and properly-sought finger-post, or positive point of departure, by the anxious mariner seeking a pilot for, or induced to run on his own judgment up to, Liverpool Bay—it is here introduced with a few general hints.

Geographical position and locality of Point Lynas Lighthouse.

POINT ELIANAS or LYNAS forms the *north-eastern* promontory of ANGLESEY,* situated in latitude 53° 25' 0" N. longitude 4° 17' 15" W. surmounted by a bulky, castle-like building, with a square tower, the basement whereof is white, to

* May be approached and rounded within a cable's length. The flood creates an alarming race half-a-mile Eastward, and the Coast draught affects the S.W. and S.E. winds, two points Westward and Eastward. H.W. F. & C. ☽ 10H. 20M.

relieve it on the dark back-ground which the eastern shoulder of the Paris mountain, *Llenelion*, presents on the north-eastern aspect. Llenelion is rendered conspicuous by its telegraph, and by rising to an altitude of 571 feet, immediately within, one mile S.W. of, the lighthouse, much assists the eye to trace the lighthouse by *day* (see view), whilst, *at night*, it speaks for itself by exhibiting a powerful *flashing* light, of the natural colour, so arranged and defined by masking, as to assure you, that, whilst you can *see* the light, you are *outside* the line of the surrounding dangers of Point Lynas.

Date of its improvement.

This light was exhibited on the 1st of August, 1835, under the improvements of position, power, and limits of operation, suggested by me, and announced to the public in the following terms:—

"Point Lynas Light, hitherto so situated as to "preclude seeing it seaward, and merely shown by "a single reflector upon the *long-shore* aspects, is "advanced to the *pitch* of the point, and exhibited "from a castellated building (with *white* basement "surmounted by a square tower) recently erected

Nature of improvement, and general effect.

"thereon, with a powerful, steady* light of the "natural colour, produced by 13 argand lamps with "reflectors, ranging over 211 degrees of the north "and south-eastern horizon, at an elevation of 128 "feet above half-tide level, rendering it visible in "clear weather 6 to 7 leagues from a ship's deck, "or within 1† league of taking up the N.W. Light-

* Subsequently a *flashing* light, (*visible* 10 seconds, *obscured* 2 seconds,) to distinguish it more readily from Skerries fixed light, and red light of Menai.

† 2 leagues to rise her *mizen* lantern, and distinguish her *three* lights.

"ship off Liverpool. This light is so masked for "local in-shore effect, as to become obscured when "brought eastward of S.E.¼E. *which clears* the "MIDDLE MOUSE ¼ of a mile; or northward of "N. by W.½W. *which clears* the DULAS ROCKS ¼ "of a mile, indicating *when* you ought to tack *out* "of RED WHARF BAY." Local effect.

It is absolutely incumbent on the mariner to make this lighthouse before he shapes his course for Liverpool Bay; nor, indeed, should the homeward voyager ever put his head eastward of N.E. after rounding the Skerries Lighthouse until he *does* see it, for then alone can he be sure of avoiding the *Coal Rock** and intermediate dangers up to the point. Moreover, by *approaching* Point Lynas, with due confidence and every effort in his power, he gives himself an opportunity of sending a telegraphic message to Liverpool,† and affords the pilot-boat on this *western* station of the port, a fair opportunity of intercepting him; the *stranger* profiting by the duty, routine, and arrangement of the Liverpool pilot-boats being here inserted. Ought not to proceed Eastward without making it.

They are eleven in number, and are in rotation relieved and stationed as follows: The *first* and *second* boats on duty hover about, or, to the northward and eastward of Point Lynas, as wind and weather may permit, or circumstances require; but not further Number of Pilot Boats, and Stations. First & Second Boats.

* This rock lies 9½ miles N.W. by W. from Point Lynas; the flood tide sets direct upon it from Skerries.

† *e. i.* Provided the local code of signals are superseded by Captain Marryat's, as I have constantly suggested. Hitherto, none but a Liverpool ship could make herself or wants known to this line of telegraph, and once out of its limits, her code was a blank to all other ships and nations.

westward than the Middle Mouse, sheltering under and looking out from Church Bay heights in strong east winds. The *third* boat cruises to the eastward of Point Lynas, to board such vessels as may miss the first boats. The *fourth* boat cruises to the northward of Beaumaris Bay, and to the eastward until abreast of the Voryd. The *fifth* boat cruises to the westward of the N.W. Light-ship, so far as to keep sight of her from the deck; which locks with the eastern limits of the fourth boat. The *sixth* boat cruises to pick up all vessels eastward of the line of Point of Air and N.W. Light-ship, occasionally stretching to the northward when the fifth boat is not within reasonable distance. They are sloop-rigged, of 50 tons and upwards; with their numbers painted in black on the mainsail and foresail, in figures of 4 feet long; their sides are yellow and bottom white; and whilst on their stations, carry a *blue-peter* by day, and a *red* light at night; but the boat on duty at the *western* station shows a *red* and a *white* light *horizontally*. None are allowed to carry a topmast, but are fitted with a long tapering white mast-head. *Half* pilotage commences at a line drawn from Formby-point buoy to the buoy on the S.W. elbow of East Hoyle bank.

Third Boat.

FourthBoat.

Fifth Boat.

Sixth Boat.

Size and Rig.

How distinguished by day or night.

Half Pilotage line.

Supposing the homeward-bound or driven-back mariner to have missed the pilot-boat after having identified his position so as to range up within a mile or so abreast (N.N.E.) of Point Lynas; he has *then* a *fairway*-course of E.S.E. 35½ miles to the N.W. Light-ship, Liverpool Bay; subject, how-

Course and distance to N.W. Light-ship.

ever, to the following considerations and careful allowances; for he will be *hurried* to the eastward of his log-rate, or *retarded*, according to the state of tide; observing that the *flood*-stream makes ¼ of an hour *earlier* than in Liverpool Bay, at an hourly rate which, upon springs, will carry him 10 miles, and, on neaps, 6 miles ahead of his *log*-reckoning, besides the fore-reaching effect of a westerly sea; whilst the *set* of stream, after getting eastward of GREAT ORMSHEAD, (situated 16 miles S.E. of Lynas, and 6 miles on the starboard beam,) inclines towards *Chester Bar*, (lying 13 miles two points on your starboard bow,) when running on your E.S.E. track; which track, at 18 miles run, leaves the CONSTABLE'S four-fathom spit, 4½ miles S.S.W. of you.* Therefore, especial allowance should be made of half-a-point more *easting* on the *flood*, and as much *southing* on the *ebb*, in order to make the Light-ship right ahead. If, however, you are taking departure from Point Lynas at *half-tide*, the one set will counteract the other, unless exceeding 7 knots, and starting at *half-flood*; in which case, steer E. by S.½S. for three hours, or until you have run 25 miles by log *and tide;* then haul southerly S.E. by E. till you make the Light-ship over the starboard cat-head, whose lights by night, or ball by day,† will be in sight from the deck of a ship at this distance, viz. 10 miles; unless it is thick weather; an event, which may have caused him to miss

Tidal allowances.

In-draught of Chester Bar.

Counteracting Courses.

When tidal deviation corrects itself.

*Menai Light, *red*, in sight westward of Puffin Island, (W. by S.¼S.) insures your being 4 miles westward of the Constables. See Capt. C. G. Robinson's Survey, published by Admiral Carden.

† See particular description of Light-ship, page 19.

Have the LEAD ready.

the pilot-boats right up to the Light-ship, and which should (having pilot or no pilot) call his LEAD into action; observing that he must not shoal his water, with his head southward or eastward, below 9 fathoms, fine sand; recollecting, at the same time, that in this region (3 leagues W.N.W. of the light-ship) the soundings obtained must be adjusted (to the *low-water* depths quoted, and shown upon the chart) according to time of tide, which rises 26 feet at high-water springs, 18 at high-water neaps above those depths, whilst at *half-tide* the soundings will *always* be 13 feet more than the depths which are here quoted and laid down as his guide; such correction of soundings, obtained alongside always necessary, (*except* at actually low-water springs,) *increases* 3 feet as you get into Liverpool Bay.

Correct the depths obtained according to state of tide.

It is on coming near to the range of the N.W. Light-ship's lights, from the westward, that the space which the POINT OF AIR Light† is adjusted to range over, is crossed by the anxious mariner; and lest he should catch a glimpse of it in interval of squalls,

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Description of *Point of Air Light.*

† Point of Air Lighthouse (a London Trinity-House Light,) is situated at the rounding elbow of the western arm of the Dee estuary, in latitude 53° 21′ 26″ N. longitude 3° 19′ 14″ W. forming the north-eastern point of *Flintshire.* It stands very low, close to high-water mark, flanked by the continuous low sand-hills which fringe Gronant Moor, extending one mile out from the heights. Its figure is that of a cylindrical thick-set tower, with *red* top, and painted in broad red and white courses alternately, down to a basement which resembles an inverted saucer; the spring-tide surf washing around it. Its light is of a fixed *bright* character, and so masked as not to throw any light in the direction of the N.W. Light-ship. It first fills all the Chester flats and bar region from W. to N.W. by N. when it pretty suddenly masks. It then fills all the Dee-water space from Helbre Island, E. to S.S.E. though, in order to assist coasters or any vessels rounding it in the Welsh Channel, whilst passing through the obscured portion of upper light, a *red* light is exhibited from a lower chamber, 8 feet above high-water level, but the upper reflectors are elevated above mean level of tide, 63 feet; ranging 9 miles westward, and visible 13 from a ship's deck.

and *conceive* it to be the Light-ship, and alter course without reflection; it is right to remind him, that, as he *cannot see* the Point of Air Light *southward* of a S.E. by S. bearing; which bearing of the *Light-ship*, at this distance, by dead reckoning, is checked by the soundings producing 5 fathoms more water than *Point of Air* range of light admits; 11 and 12 fathoms, with sand and patches of mud, being the low-water soundings 3 leagues north-west of the Light-ship, and 6 and 7 fathoms in that aspect and distance from Point of Air; whilst 18 fathoms indicate the fairway-track when westward of Ormshead.

How Point of Air and Light-ship are distinctly situated by aspect-soundings.

With such a distinction of circumstances, it can hardly be supposed that the Point of Air could be *made-for* through unconscious deviation of run from the westward, unless the Light-ship had unfortunately parted her moorings, when her absence *might* perplex the evidence of bearing and soundings. And true it is, that each occasion of such disaster has been fatally attended. A steamer (Lord Blayney) was wrecked, with all hands, on that extreme spit of West Hoyle which bears S.E. by S. 5 miles from Point of Air, in 1834; and who will forget the miseries of January 7th, 8th, and 9th, 1839!!! It would be but discreet, therefore, to pause—having made but *one* light on that bearing—to give the Floating-Light a *chance* of breaking to view through the flying squalls, which it must do if the Point of Air can be seen for an interval of many minutes, and, the ship at her station. *Identity* is certain by *three lights;* but

Fatal facts.

Round-to until certain.

should they, by line-of-keel direction, blend like *one*, her blue-light,* at two hourly periods, decides you.

Supposing a *day-time* approach, in thick weather, when a ship may be incautiously hauled southward of her fairway track, or be *working* up against an easterly wind, and stealing as much as possible on the larboard tack, guided by an active LEAD; there are two buoys lying on the same bearing from the Light-ship, (W.½S.) at the separate distances of 9½ and 7 miles; and guarding the outer margin of the 'Chester Flats,' flats which shoal-up to 2½ fathoms from 4 fathoms at half-a-mile northward of these buoys: the *westernmost* of the two is a chequered *black and white can*, with an erect perch and ball, (marked 'N.W. Patch;') the *eastern* buoy of the two is a *black nun*, (marked 'Bar.') It should be borne in mind, that, as the northern, *i.e.* outer, margin of WEST HOYLE bank trends east and west, and nearly upon a line with this *bar-buoy* and light-ship, presenting a *steep-to* edge for 6 miles, a ship in thick weather should never shoal her water below 6 fathoms, with her head to the *southward;* and in clear weather, never open the CROSBY POINT LIGHT† *southward* of the Light-

Buoys, soundings, and long mark for keeping clear of West Hoyle.

* The advantage of these blue-lights since May 1836, led me often to suggest 1 every hour, and a ROCKET every 2 hours: I again urge it.

Description of *Crosby Light-house.*

† CROSBY LIGHTHOUSE,—a *wooden* structure, erected by the Dock Committee of Liverpool, and lighted October 10th, 1839. It acts upon the *line of direction* (in conjunction with a floating-light) pointed out by me in especial report to that Committee, dated October 4, 1838, urging the necessity of, and my undertaking to *produce*, a fresh entrance into the New Channel, and for superseding the *Formby* Light as no longer applicable to that channel. The new fabric presents to the eye from seaward a flat-faced shaft, in width one-fifth of its height, and shored-up on either side. It exhibits a *red, fixed,* light, at an altitude of 81 feet

ship: the *clearing* mark as far westward as the N.W. Patch Buoy is, with that lighthouse, *open a handspikes' length, (or 2 degrees) northward* of the Light-ship, upon E. ¼ S. bearing.

Crosby Light (red,) rises above the horizon when approaching the N.W. Light-ship from the westward, on the fairway track E.S.E. at 6½ miles from her, or 3½ miles *within her range*. And as all the *shore* lights, like Crosby, make out sooner than the *Floating*-light, from their means of intensity and altitude; and as the shore lights owe their distinctness in the offing to the direction of the wind—*south* winds shrouding Crosby Land with the smoke of Liverpool, and *east* winds Bidston and Leasowe, whilst *south-east* winds obscure even the Rock Light and N.W. Light-ship—it will help the eye to pick up the Light-ship, the having in mind how they relatively range outside *her* range, and upon what bearing either of those lights will lead *to* her, or suggest the bearing whereon to *trace* her. For instance, Crosby Light bearing E. ¼ S. (it must never be brought *northward* of east, or you are upon West Hoyle,) directs your eye for Light-

Relative position of Shore and Floating Lights, and what bearings lead to N.W. Light-ship.

above H.W. level, 96 above half-tide level, or 111 above L.W. level, ranging to an average horizon in the *western* aspect, which permits its being picked up 16 miles off, from the deck of a ship; but it is limited for local purposes to a 95-degrees' *embrace* of aspect, viz. from S.W. by W. ¼W. to N. by W. ¼W. It stands at the H.W. margin of Sandhills, which form the rounding trend of coast-line between the Liverpool Docks and Formby Point, bearing from the recently-lighted tower—*Formby S.E. mark*—S.S.W. 1¼ miles. Crosby Church (dark square tower) and White Mill lie at equal breast-distance Southward, as the S.E. mark does Northward, affording well-known objects for identifying the low-stretching eastern arm of Liverpool Bay, when approaching from the Northward or N. Westward, in the event of Crosby Lighthouse being prostrated by fire or gale. Its site is situated in latitude 53° 30' 48" N. longitude 3° 3' 53" W.

Bidston Light. ship E.¼S. Bidston* Light ranges 3 miles further westward than the Light-ship; its bearing of *intensity* is, however, right *over* Leasowe Light and *her*, therefore bringing it S.E.¼S. will lead *to* her. Then rises above the horizon, at the same time as Leasowe Light. Light-ship, but with more distinctness, *Leasowe Light*,† upon the same bearing: as, however, the bringing on that bearing, S.E.¼S. would cause an unnecessary offing to a ship running up from the westward with a south or south-west wind, he must, laying E.S.E. from Point Lynas, expect to make Bidston and Leasowe successively, upon the bearing of S.E. by E. Then at 5 miles from Light-ship, Rock Light. that powerful *intermittent* Red and Bright *Rock Light*‡ rises upon the bearing of S.E. by E.¼E.

Description of *Bidston Lighthouse.* * BIDSTON LIGHTHOUSE,—*(Liverpool Dock Trust,)*—a dark stone-coloured octagonal tower, situated upon the ridge of high land which rises from Wallasey Pool and Bidston Marsh, trending 1¼ miles S.S.W. upon the promontory of Cheshire which divides the Dee and Mersey; and helping the eye to distinguish the first stretching of the *western* arm of Liverpool Bay. The shoulder of this hill, (known as "Bidston Hill,") upon which the Lighthouse stands, is situated 1¼ mile in-land; a dark looking wind-mill stands on the same ridge, ¼ of a mile S.S.W. The Lighthouse lantern is elevated 244 feet above half-tide level, permitting a range of 17¼ miles, or, of being distinguished 21 miles from a ship's deck, it sends forth a fixed bright light in fullest refulgence, north-westward, right over Leasowe Light, two miles seaward of it, in conjunction, affording an active transit of lights for navigating the "Horse Channel;" Bidston Light is masked for local *in-shore* effect upon a N.N.E. line, *i.e.* indicating when you are abreast of the East Wharf Buoy, in Rock Channel.

Description of *Leasowe Lighthouse.* † LEASOWE LIGHTHOUSE,—*(Liverpool Dock Trust,)*—a conical white tower, situated near the high-water mark, 2 miles seaward (N.W.¼N.) of Bidston Lighthouse, and 3¼ miles westward of Rock Light. It exhibits a *fixed bright* light from a lantern elevated 110 feet above half-tide level, throwing its focal strength to the N.W. over the Light-ship, commanding a 12-mile horizon, but visible 16 miles from the deck of a ship; its only desired object was in conjunction with Bidston, to act as a line of sea-lights for the Horse Channel, until 1837, when I masked it, as well as Bidston, for checking course in the Rock Channel, so that when Leasowe Light disappears in the Rock Channel, (bearing S.W.) you are abreast of the West Wharf Buoy.

Description of *Rock Lighthouse.* ‡ ROCK LIGHTHOUSE,—*(Liverpool Dock Trust,)*—situated at the mouth of the Mersey, a cable's length within the low-water extremity of

which, if brought to bear S.E. by E. (easterly,) will lead right up to the Light-ship. It is true that the Point of Air Light is the first which rises to view after leaving Point Lynas and Menai Lights, but Bidston is the first in Liverpool Bay. The relative bearing, however, of Point of Air, when running up upon the E.S.E. track to Light-ship, should be distinctly impressed on the mariner's mind, especially as it rises 4 miles westward of the Light-ship's range, though, fortunately, to avert confusion, two points, nearly, more

rocks upon which it is based, 12 feet above L.W. level, at a quarter of a mile outside H.W. mark. An isolated Fort, constructed of red sandstone, stands midway between it and the elbow of Sandhills, recently called New Brighton Point. This point forms the north-eastern elbow of the north promontory of Cheshire, where part of the Mersey still turns at right angles westward into Liverpool Bay, endeavouring to keep open the Rock Channel. The Lighthouse is not easily distinguished amongst the passing vessels and numerous straggling land objects on the Liverpool side: the eye, however, will be assisted by reference to the views in Appendix, and bearing in mind that it stands at the very throat-angle of Liverpool Bay. The building presents a beautifully proportioned Eddystone, or bell-shaped tower, of a lime-stone, greyish colour, surrounded by the tide from two hours' flood till four hours' ebb. Its lantern is elevated 77 feet above half-tide level, commanding a 10½ mile range of horizon, but visible 14, from the deck of a ship. Its light is remarkably good, and well distinguished from all others in this bay or in the Irish Sea, being of intermittent *colours*, as well as *revolving*; its order of showing, is two *bright* faces and one *red* in uniform gradual succession, the refulgence of each being at intervals of one minute. A momentary obscuration of light occurs at like intervals; the length of its darkness increases as you distance it. In 1835 I arranged tidal signals for night and day guidance at this Lighthouse, and subsequently caused Fog Bells to be rung in succession towards the Rock, Crosby, and Mersey Channels. The tide signals are thus;—when the tide has risen so as to produce 12 feet over Rock Gut Bar, a *fixed* bright light is exhibited from a lower chamber, (half-way down the building,) down the Rock Channel and up the Mersey, until 12 feet water *ceases* on the bar. A *black ball* indicates the same by day, when hoisted above the balcony. The Lighthouse bears from N.W. Light-ship S.E. by E.¼E. 8¾ miles; from Leasowe Lighthouse E.¼N. 3¼ miles; from Formby Floating Light S. by E.¼E. 6¾ miles; and from north end of Docks N. by W.¼W. 2 miles. I had the satisfaction of improving the brilliancy of the *red* light, at the same time as lessening trouble and expense, by adopting red *cylinders* instead of red *shields*. The mariner desiring life-boat assistance will be relieved in his suspense, on perceiving a *blue flag* hoisted at this Lighthouse in token of *assistance preparing*. The thanks I have received for this arrangement alone, afford a vivid proof of how the slightest anticipation on *shore*, can relieve the helpless *afloat*.

to the southward than the anticipated Light-ship, viz. S.E.¼S. and you are out of its focal aspect when it bears S.S.E. before which you will have arrived within the ranges of Bidston, Leasowe, and Floating-Lights. Again, supposing you to have run your distance, and the Light-ship really adrift, you have a *check-light* presented on the bearing of S. by E.½E. viz. HOYLAKE* *(lower)* Light, which is so masked as to only burst to view when you have arrived *half-a-mile eastward* of the Light-ship station; of course, Bidston and Leasowe Lights (called locally the *sea-lights*) coming in one, or opening *eastward*, would indicate your having come up to her station, and arrest your *easting*, or invite you up the Horse Channel: it, however, does occur, that the same haze or smoke which obscures Bidston, does not affect Hoylake Lights to the same extent; hence, a double check on the fairway course suggested itself to me in 1836, as desirable, when the lower Hoylake was masked accordingly.

How *Lower* Hoylake Light checks the run.

With such hints, and due vigilance, the mariner, *having made Point Lynas*, may be encouraged to

Occasions of running up by Chart & Book

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* HOYLAKE LIGHTHOUSES,—*(Liverpool Dock Trust,)*—Two white buildings, situated obliquely to the line of Hoylake coast line, ¾ of a mile eastward of Helbre Point, at the northern extremity of Cheshire. The one nearest high-water mark is a rounded gable of a dwelling-house, with its lantern 47 feet above half-tide level, ranging 7¼ miles. The inner and upper Lighthouse is a sugar-loaf tower, with lantern 72 feet elevated, and ranges 9¼ miles. The buildings lie S.W.¼S. 1-5th of a mile apart. They throw their best light bright and *fixed*, directly in their line, N.E.¼N. forming a leading mark clear of '*Dove Spit*,' and checking the Bidston and Leasowe line for turning up Rock Channel or anchoring. The *lower* light is so masked as to denote when you are abreast of N.W. Spit of East Hoyle, S. by E.½E. upon line of the *Sea-lights*, (Bidston and Leasowe so called). And the *upper* light is so masked as to indicate when you are due north of it, and checks the sea-lights' course half a mile N.W. of Buoy of Flats in Horse Channel. These are the southwestern lights in Liverpool Bay.

Description of *Hoylake Light-houses.*

run *for*, or *work* up to, the Floating-Light station in Liverpool Bay, *without a* PILOT; and such an exigency and responsibility does and may occur, for, notwithstanding the judiciously apportioned stations, and alertness of the Liverpool pilots, it *may* happen that no interception takes place until arriving at that part of the bay where the Light-ship becomes the finger-post into the port by one channel or the other. And even here stress of weather may preclude a pilot-boat's presence either to ship a pilot or to *lead* in. It is for such a case that these directions, and the large-scale Charts which I projected, 1833-5-7-8, were intended to provide, but even with the smaller and general Chart herewith offered of 1839, the mariner should not hesitate to avail of his *leading* wind, and proper advance of *flood*, rather than risk trailing on the banks under tattering canvas, during a squally night at N.W. Therefore I repeat, if you are *at* the N.W. Light-ship station, in Liverpool Bay, on the closing of a winter's day, do not merely run on as a choice of evils, but with all *confidence*, recollecting that, *lead and look-out* have carried some of us through *unexplored* channels, whilst *here* you have the buoys like a *hand-rail*, right and left, with conspicuous leading-mark objects, and a tide that *lifts* nearly a fathom an hour.

when piloting cannot be obtained.

Encouragement to run into port.

A *stranger* glancing at the chart of Liverpool Bay, with its shoals sweeping six miles outside its flat shores, and trending eleven miles westward of its centre or *key*, (which the Light-ship may be termed); would perhaps startle and question the

Comparative aspect of this Bay regarding murky-weather winds.

propriety of so inviting him to make a *lee-shore* of this bay; but not so when he considers how the aspect of this bay favours his approach, compared with the *South* coast of England, Ireland, and Wales; the ports of which are shrouded and become lee-shore traps upon murky southwesters, when you frequently cannot see half a mile a-head; the reluctant but cautious *heaving-to* with a fair wind into your port, because you cannot make it out, is succeeded by finding you have driven *past* it, and not unfrequently ends by being cast on a headland, which no efforts to claw off could avert after it loomed through the hazy mist of a south-wester,

Effects of off-shore and on-shore winds.

winds which are *off* shore in Liverpool Bay; whilst the *on*-shore and prevailing winds, from west to north being *clear-weather* winds, relieves it from any of the perplexities and hazards alluded to; in fact, the harder it blows you *towards* the Port of Liverpool, the clearer to view are the lights and beaconage, except at squally intervals;* a true consolation to those who arrive in the Channel under our furious and ship-stressing northwesters. It is true that southerly winds cause total obscuration of the lights, beacons, and coast feature in Liverpool Bay, being particularly charged with the smoke of an extensive manufacturing district; but it is a *smooth-water* wind, which favours hugging the banks with the seaman's stand-by '*lead and look-*

* The *Buoys* in hard gales must not be calculated upon; for, however large, they are then smothered in spray or spoon-drift. I do not despair, however, of eventually obtaining for the mariner, well-planted, lofty *Perch-beacons*, at each spit and elbow of the Channels, making out and *holding on* when most wanted.

out,' until the long anticipated pilot intercepts him. Therefore the mariner is first prepared to advantage by a pressing *fair* wind *without* a pilot, and secondly, to steal up to the entrance on slant winds, where a pilot is *sure* to be ready for him near the Light-ship, if not before. We have only, therefore, to claim discernment on the part of ship-masters, and zealous attention on the part of pilots, in return for the most extensively lighted, beaconed, buoyed, and charted navigation in the world,* to ensure a continuance of safe intercourse, which in the year 1837 (the third year of the New Channel being lighted) was an unprecedented instance in proportion to the intercourse of a single port, viz. 9 vessels only got aground, (7 of which got off); whilst upwards of 30,000 passages were effected in and out; a decrease of casualties which will be best understood by those who held Liverpool proverbial for shipping disaster; whilst another effect of the new buoyage facilities was instanced in the Government-packet intercourse with Dublin *viâ* Liverpool. Those packets were subject to tidal delays, and transfer of mail and passengers to different-sized vessels at the harbour's mouth, 260 tides in a year; whereas in 1837 it was under 30 instances in a year. To such as may, notwithstanding, get into difficulties, it will be of vital import the knowing that their position will be anxiously watched and communicated by the lighthouses and telegraphs to the town, for "tug-steamer assistance," and to the

Results of improved Beaconage.

* 2 Floating Lights, 1 Bell Floating Beacon, 57 Buoys, *with duplicates of each*, 7 Lighthouses, and 10 Seamarks.

life-boat stations.* It has been the object of my survey and delineation, to give the pilot and commanders of vessels all the advantage which so great a rise of tide affords about shoals at stated times, which if attended to, in point of *time* and reference to the *heights* of the banks above *low-water level*, and the soundings of low water, *shown upon the Chart*, will reduce the intricacy, by widening each channel and deepening each shallow very considerably every hour; of course this applies to *inward*-bound vessels, taking *the flood; outward*-bound vessels, on the *ebb*, will have to view the corresponding *fall* of tide with caution. Such, however, are sure to have a pilot, or be well acquainted, an inference which renders it sufficient that these directions provide for, and be addressed to the *inward* bounders, reversing the courses of tide and leading marks being all that a discerning seaman need do to appropriate them, if *outward* bound. I now propose, for his further study up channel, the application of the annexed TIDE-GUAGE TABLE and data, so that he may determine, according to *wind*, *time*, and *tide*, which channel he will take, or what banks he may make free with. With respect to the *channel* he proposes, he should consult circumstances, and have resolved, by the time he has made the Light-ship, or *considers* himself within her range. And here I would prepare him for the appearance and bearings

How the vertical action of Tide influences intercourse.

Appearances of the Land on arriving within the Light-ship's range.

* The Life-boats are stationed at Point of Air, at Hoylake, at Formby Point, and at Magazines, just within the Rock Lighthouse; and now that a Lighthouse is on Crosby Land, I do hope a Telegraph there will be conceded. Bidston station *may* take up *its* signals, though unable to do so from Formby Lighthouse during the last four years' necessities of the northern approaches.

of the land on approaching her range; for instance, he will have the high land of the north-eastern part of *Flintshire,* showing a cluster of hummocks, the nearest one rendered conspicuous by its telegraph, called *Voel Nante,* elevated 777 feet, and bearing S.S.E.¼E. A break is immediately apparent eastward by the *low* Point of Air and mouth of the DEE estuary, until resumed by the high land of *Cheshire,* called *Heswell,* elevated 345 feet, and bearing S.E. succeeded eastward by Bidston-hill Lighthouse and mill, 198 feet, and Wallasey ridge, with its square-towered church and mill, which over-laps, but is over-topped by the high land directly over the north end of Liverpool, called *Everton,* elevated 323 feet, and *Walton* 219 feet, each rise surmounted by a square-towered church, the whole extending to E.S.E. the bearing *on which the Light-ship will lie if you are on the fairway line* from Point Lynas.

Voel Nante. Heswell. Wallasey. Everton and Walton.

Now the eastern arm of Liverpool Bay is comprised between Walton and Formby Point—a continuous flat, and trending at right angles to the Bidston land—so flat, that the base of Formby S.E. Mark is but 3 feet above high-water level; nor does any back-land rise nearer than the ridge of *Ormskirk,* elevated 304 feet, the abrupt northern shoulder of which terminates directly east of the sea mark, 6½ miles distant, and affording a conspicuous back-ground that makes out above the horizon, 9 miles westward of the Crosby Lighthouse rising to view; thus assisting the eye to trace the lighthouse when running up. And it is important on

Eastern arm of Liverpool Bay. Formby. Ormskirk. Inducement to

make out the Inland feature.

northerly winds that it *should* be discerned as soon as it rises, night or day, as it so happens then to intersect that spot of your fairway-course to Light-ship, from whence you should haul up for the NEW CHANNEL. It will be right to *remind* the mariner at this position, in case the wind should draw eastward, that, whilst on the larboard tack (standing

Beware of West Hoyle.

southward) he must never open Crosby Light southward of the N.W. Light-ship, nor bring the Light-ship northward of east, (if only seeing *her,*) or he will risk getting on the steep-to margin of the *West Hoyle* Bank, along which not a buoy warns you for 6 miles.

Shore and Maritime feature comprising Liverpool Bay.

In speaking of Liverpool Bay, it will be necessary we agree upon its *maritime* boundary: its *shore* boundary would limit it to a triangle, formed by *Helbre Island,* the *Rock Lighthouse* junction with the orifice of the Mersey, and *Formby Point;* its arms trending 8 miles east and west from the Rock Lighthouse vicinity, producing a cross-distance between the extremities of 12 miles, and yielding a *depth* of bay, as it is termed, of 5 miles. As, however, that cross-distance intersects a great portion of the detached banks which *dry up,* and form the channels into Liverpool; and as the north margin of the *West Hoyle* Bank projects 4 miles off, and lateral to, the main, upon a North and West trend, altogether extending 8 miles westward of the Light-ship, along which ships have to skirt when on their fairway-track from the westward; I consider the *maritime* features of Liverpool Bay to comprise a triangle formed by the western patch of

West Hoyle, (Blaney Patch)—to the N.W. Spit of East Hoyle, and Six-feet Flats—and thence to the elbow of low-water shore which outlays Formby Point, called *Mad Wharf;* the arms separately trending W. 8 miles, and N.E.½E. 9 miles, their extremes being extended 16 miles asunder, and producing a line which passes 1½ mile outside (north-westward) of the Light-ship, leaving a *depth* of bay, to the nearest sand-heads from the centre of the cross-distance, of 3 miles; and to the nearest part of coast, *Hoylake*, 7½ miles. It will appear from this figure of the bay, that the Light-ship not only lies in the actual *fairway*, E.S.E. from Point Lynas, but occupies a safe *offing* position *in the bay*, being 1 mile from the outer sand-heads of East and West Hoyle Banks, where they form the *Horse Channel* into Liverpool, and the *Helbre Swash* into the Dee, or Hoylake. She lies in 7 fathoms at low-water springs; and from her being the outer (north-western) beacon object of the port, is called the NORTH-WEST LIGHT-SHIP, presenting a bluff-built hull, of about 130 tons, with a short bowsprit, and painted black: she is *three-masted*, carrying at the main a large *black ball* by day, and exhibits *three* brilliant bright lights (between sunset and sunrise) from lanterns fitted *round* the masts, with 8 lamps and reflectors in each, appearing in the order of fore, main, and mizen *tops*, respectively elevated 32, 40, and 26 feet above her water-line, so that they cannot blend as *one* light, except at a considerable distance, or in hazy weather; to provide for which, and to

Relative position of Light-ship in Liverpool Bay.

Description of N.W. LIGHT-SHIP.

distinguish her from all other lights in the region, a BLUE LIGHT, of 3 minutes' duration, is burnt on board of her every *two hours* of darkness, according to the seasons, and *mean* time at Liverpool, thus: during November, December, January, and February, 6, 8, 10, 12, P.M. 2, 4, and 6, A.M.; March, April, September, and October, 8, 10, 12, P.M. 2 and 4, A.M.; May, June, July, and August, 10, 12, P.M. and 2 A.M.—*See copy of Advertisement of April* 30, 1836, *in Appendix.* To allow for difference of time at ship, a look-out should be kept in the anticipated bearing 5 minutes before the respective hours. These blue lights being elevated on a pole, can be seen in the horizon as soon as her mizen lantern rises to view, which is at 10 miles' distance.* During fog this vessel rings her bell, and sounds a gong alternately; and to give a chance of being 'peered-out' *under* a dense haze, the mizen lantern is lowered level with the gunwale. It will also be useful to know, by those who possess the Liverpool code of signals, that this vessel can take them up and pass them on, in telegraphic order, to Helbre semaphore. I would suggest that steamers, running up in a fog, heave-to occasionally, to catch the sound of the gong uninterrupted by the paddle noise; and would observe to those who may be hovering in her region, waiting for water through the Rock Channel, that it is desirable they keep *two cables* off the Light-ship, or they may very unthinkingly obscure her lights by their smoke and

Her Blue Lights at stated hours.

She can pass Signals on to Helbre.

Steamers should not hover too near.

* I am so impressed with the advantages of these Blue Lights, as to hope they may be afforded *every hour*, and a ROCKET every 2 hours.

steam-escape. To vessels that may be arriving in the bay about the usual time of the Government Mail-boats, it will be useful to know that the Light-ship repeats a gun for every one supposed to be fired in hazy weather by those packets. This Floating-Light lies on the fairway-course *into* the Horse Channel, (S.E.$\frac{1}{2}$S.) and *into* Helbre Swash, (S.$\frac{1}{2}$E.) Her best adapted site at this date is intersected by the following cross-marks, bearings, and distances, viz.

She fires a Gun in answer to Mail-boats.

Bidston Lighthouse—its apparent breadth open *eastward* of Leasowe Lighthouse, S.E.$\frac{1}{2}$S.

Her Cross-marks and Bearings.

The Helbre Swash Marks—their apparent breadth open eastward, S.$\frac{1}{4}$E.

Crosby Lighthouse, E.$\frac{1}{2}$S. .....distant 9 miles.
Rock Lighthouse, S.E. by E.$\frac{1}{2}$E. „ 8$\frac{3}{4}$ „
Leasowe Lighthouse, S.E.$\frac{1}{2}$S..... „ 6$\frac{1}{3}$ „
Helbre Telegraph, S.$\frac{1}{4}$E..... „ 4$\frac{3}{4}$ „
Point of Air Lighthouse, S.W.$\frac{3}{4}$S. „ 5$\frac{3}{4}$ „

She lies in 7 fathoms (fine sand) at low-water springs, with 9 fathoms between her and the entrance of Horse Channel and Helbre Swash; whilst the soundings shoal up from 10 fathoms (fine sand) in her *western* horizon, 10 miles off, and at that distance to the *northward* 10 fathoms (sand and mud) will likewise be found; but vessels approaching cautiously by the lead from that direction, should expect to get soundings on a five-fathom ridge, of $\frac{1}{4}$ a mile width, when 2$\frac{1}{4}$ miles north of the Light-ship, deepening again to 7$\frac{1}{2}$ fathoms between her and the ridge. The ship's position is upon the western extreme of the seven-fathom

Soundings around the Light-ship.

under-shelf, which trails from the *Newcome Knowl*, and on the eastern margin of the Horse Channel stream, where the EBB-tide sets past her W. by S. during the *first hour*, W. by N. the *second hour*, and N.W. the last 4 hours: the FLOOD-tide sets by her the whole 6 hours S.E. by E. being rather towards the *Six-feet Flats* than the Horse Channel fairway. Each tide *turns* as it ceases to *rise* and *fall*, (which is ¾ of an hour *earlier* than at the docks,) but no perceptible difference in flood and ebb velocity exists. From the following table, however, the mariner will gather at a glance the rate of his hourly drift in calm hazy weather, upon springs and neaps.

Set of stream at Light-ship.

Progressive velocity of stream.

RATE.	1st hour.	2nd hour.	3rd hour.	4th hour.	5th hour.	6th hour.
Springs.	¾ mile.	1¼ mile.	2¾ miles.	2 miles.	1 mile.	¼ mile.
Neaps..	¼ „	1 „	1¼ „ .	1 „	¼ „	¼ „

And thence, the extent of his offing with reference to the time he passed the Light-ship on the *ebb*, or suggesting when he should anchor with reference to his draft of water on the *flood*; observing that the whole amount of *spring-tide* drift in the vicinity of the Light-ship is not more than 8½ miles, and a *neap-tide* drift 4½ miles; therefore, as the nearest shallow (Six-feet Flats) in the tide's-course is 4 miles from the Light-ship, it would be half-flood (15 feet *rise*) before he drifted there, which would yield thereon 21 feet water; the *fourth* hour drift would bring him to the North-bank Spit, with 12 feet *over* it, but on *neaps* it would be *high water* before he could drift to that spit at all. It is there-

Effect of Ebb or Flood upon a Ship becalmed near Light-ship.

fore also clear, that, if a ship is becalmed at *half-ebb* abreast of the Light-ship, she will have attained an offing of her on springs of 4¼ miles, and on neaps 2¼ miles, from whence the *whole* flood cannot drift her upon a shallow. This knowledge of the *set* and *velocity*, connected with the half-hourly *rise* of tide, will be of paramount importance to the ship-master or pilot, as to *when* he may bear up with a leading wind for either of the channels, in reference to the soundings therein, and his draft of water; the which (time of high water being computed or taken from tide table, and time at ship being correct) is afforded him by the annexed Table, Data, and Examples:—

A TIDE-GAUGE TABLE FOR THE ENTRANCE OF THE MERSEY,

Adapted to show the height of water above low-water level *of Ordinary Spring Tides at* any *required period, and hence when the several Channels may be taken or Banks crossed.*

When it is High Water at or near *either of the following times.*	*There will be at each half-hour* before *or* after *the respective High-water periods as hereunder expressed:*												
	H. W.	Last ¼ hour's Flood, or first ¼ hour's Ebb.	Five hours' Flood, or 1 hour's Ebb.	½ Flood, or ½ Ebb.	Four hours' Flood, or 2 hours' Ebb.	3½ hours' Flood, or 2½ hours' Ebb.	Half Tide.	2½ hours' Flood, or 3½ hours' Ebb.	Two hours' Flood, or 4 hours' Ebb.	½ Flood, or 3½ Ebb.	One hour's Flood, or 5 hours' Ebb.	First ¼ hour's Flood, or last ¼ hour's Ebb.	L. W.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
XII o'Clock	30	29	27	25	22	19	16	13	10	8	5	3	2
XI or I „	29	28	27	25	22	19	16	13	10	8	6	4	3
X or II „	27	26	25	24	21	19	16	13	11	9	7	6	5
IX or III „	26	25	24	23	21	18	16	13	11	9	8	7	6
VIII or IV „	25	24	23	22	20	18	16	14	12	10	9	8	7
VII or V „	24	23	22	21	20	18	16	14	12	11	10	9	8
VI „	23	22	21	20	19	18	16	14	13	12	11	10	9

Note.—At Equinoctial seasons the Tide will exceed the rise and fall shown in the above Columns, by *two feet*, Westerly gales accelerating, and Easterly gales retarding the *Flow* about ½ of an hour: events, which affect the *Soundings* in like proportion.

Rise of Tides above Equinoctial Low-water level at Light-ship. { Equinoctial Springs..... XXX feet; Ordinary..... XXVII „; Neaps..... XX „ }

High-water at Full and Change, ☽ Xh. 22m.

Example 1*st*.—Supposing you to be at the Light-ship upon a young flood, with the wind at N.W. (a fair wind into either channel,) your ship draws 15 feet; it is high water in the vicinity at XI, a.m.: when will you have 18 feet over the Rock-gut Bar? Example for Rock-gut Bar.

The least water on the Rock Bar at low water is..... 2 feet.
The Tide-guage Table shows, opposite XI and under 3rd hour, or half tide .....16 „
At 8, a.m. there will be on Rock Bar .....18 feet.

Example 2*nd*.—The wind is scant, at S.S.W. you will save tide into the river by making a board *over* the North Bank Spit: when will you have 18 feet upon an XI o'clock tide? For North Bank on scanty wind.

The highest part of North Spit dries up .... 9 feet.
Opposite XI, and under 5 hours' flood is....27 „
Therefore at 10, a.m. there will be on it ....18 feet.

Example 3*rd*.—You purpose taking the New Channel as early as possible upon an XI o'clock tide: when will you have 17 feet over the bar thereof? For Victoria entrance to New Channel.

The least water on marks of New Channel-entrance of 1839 (Victoria Channel) is....11 feet.
Opposite XI, and under 1st hour flood is.... 6 „
Therefore at 6, a.m. you will find on the bar..17 feet.

To adjust a Sounding for reference to Chart.

Example 4th.—You have run your distance for the Light-ship in thick weather; you have 9 fathoms alongside; it is 3 o'clock, a.m. and high water at I, a.m. therefore 2 hours' flood: what depth must you reduce to, to compare with Chart?

Opposite 1, and under 2 hours' flood ..... 10 feet = 1⅔ fathoms.
Sounding obtained alongside.... 54 „ = 9 „

Soundings reduced to low water, and to be sought on Chart.... 7⅓ fathoms.

Hints when approaching from the Northward.

Before, however, we proceed to describe or navigate either of the channels, the mariner's approach from the northward must be anticipated; a direction producing vast intercourse, though not of such heavy vessels as from the westward. A few hints are therefore due, (at the risk of interrupting our thread just taken up at the Light-ship,) to aid the *making-out* the port, and identifying the lights in that direction in like manner as I have attempted to prepare the mind's eye of him from the westward. And as the channel chiefly used by the northern traders is the *Half-tide Swatchway*, (which was buoyed and rendered navigable when I suggested lighting the New Channel, in 1833;) and as the fairway course of that swatchway bears S. by E.½E. from seaward, I shall take up my offing position on the horizon of that bearing where the first light of Liverpool rises to view, both on account of its leading to the Formby Light-vessel, and being nearly upon the Isle of Man track.

Coast of Wales feature.

The first land, in the region of Liverpool Bay, that you make from the northward, is that part of Flintshire directly over Point of Air and Holywell, on the bearing of *south*, rising seven leagues outside the range of the highest lighthouse, (Bidston fixed bright white light.) You will carry higher land much farther westward, such as Ormshead, in Denbighshire, and Penmaen Mawr, Caernarvonshire; but our present business is to look out in the region of *Liverpool*. Proceeding *southward*, therefore, the next land you make will be on the *larboard* bow, more contiguous to Liverpool, viz. 'Ormskirk land,' surmounted by church and mill, already described as lying 10 miles N.E. of Liverpool Docks, and 8 miles directly in-land (E. by S.) of Formby Point. Ormskirk should here bear of you S.E.$\frac{1}{4}$S. 8 leagues, with 22 fathoms (muddy bottom) alongside, and giving you a distance of 5 miles to run before the said *first* light of Liverpool navigation rises, and 5 leagues northward of the outermost danger of that bay. Looking out on the *starboard* bow as you run out the 5 miles, Bidston-hill—its lighthouse and mill—will rise on the bearing of S.$\frac{1}{4}$E. which, with Everton land and church right a-head, shows you the Mersey entrance in the division of those two land features. Here you will have 13 fathoms, (soft mud,) with the stream of flood E.N.E. and ebb W.S.W. setting directly athawt your S. by E.$\frac{1}{4}$E. course. Three miles further on, if night, and the next light in succession will appear, viz. the fixed red light on Crosby land, which *unmasks* on the bearing of

Relative position of *Ormskirk*.

Soundings in Northern aspect.

How the Lights rise to view in Northern approach.

S. by E.¾E. Then half a mile further, and the *next* light in succession rises, viz. Leasowe, (bright and fixed,) on the starboard bow, bearing S.½E. Now look out right a-head, and in ¾ of a mile more run, the Formby *Floating*-light (bright) will appear at the same instant as, (on the *starboard* bow, bearing S. by W.½W.) will the N.W. Light-ship, (three bright lights). By day, however, the high land of Everton a-head, upon the bearing of S. by E.¾E. leads the eye over the Formby vessel; and the heights of Holywell, in Flintshire, leads over the horizon-point of the N.W. Light-ship, on the bearing of S.S.W.¾W. Proceeding 1½ mile further, you rise the final and most remarkable light of this navigation, viz. the *Rock Light*, the figure of which is not very discernible by day, but its light is most brilliant, bursting forth at minute intervals, with a red-face every third minute; it does not, however, always make out under the same circumstances of weather as the other lights, in consequence of its proximity to the town smoke-drift on S.E. winds. At the juncture of rising it in clear weather, you are at least 5 miles outside the dangers in the northern approach to Liverpool, with 11 fathoms alongside, (muddy bottom.) This light being a-head on the course of S. by E.½E. will be *in one* with the Formby Floating Light, when, if it is before half ebb, at or after half flood, you will have 19 feet water over the flats to the Light-vessel; otherwise, with the wind N.E. and young flood, haul up for the Formby Old Channel, bringing Formby S.E. Mark S.E.½S. upon which bearing the N.W. Seamark will come

Leasowe.

Formby Floating-Light.

N.W. Light-ship.

Progressive appearance of Rock Light.

Effects of S.E. winds.

Soundings indicating distance and safety.

Considerations as to taking Formby Channel or Half-tide Swatchway.

in one, leading you up to the first buoy on your larboard shore, a black nun buoy, (F 1,) guarding the steep edge of Madwharf. If, however, the wind is north or westward, and falling tide, haul westward of south, say S.¼W. for the Floating Bell Beacon at Victoria entrance of New Channel.

Haul for Bell Beacon if after half ebb.

During the five previous years to this revision of my survey, viz. since 1833, when I planned the lighting and buoying of the NEW CHANNEL, no encouragement should have been withheld, or efforts spared, to *make-for*, and avail of the leading objects pertaining to it; as its tidal advantage offered ingress or egress for vessels of 12 feet draft *four hours after the other channels were closed*, whereby 6000 vessels per annum held intercourse with the port 2 hours on each side of low water more than they otherwise could, thus averting all the delays and risks of heaving-to or clawing-off till tide time on a closing winter's day. Indeed, as many as 12,000 passages were registered through that channel per annum; besides decreasing the tidal detention of Government Mail-boats to Dublin to 10 instances in a year, from 261, which it was in 1832. At the close of 1838, however, the mariner was interdicted from advancing eastward of the N.W. Light-ship until *half flood*, for the entrance of that hitherto early and important channel, by collapsing its spits and twisting into crescent figure, had become inaccessible by any operation of the existing lights. Such did not result from *sudden* knowledge or alteration, but from a progressively *detected* disposition and movement to which I, from time to

General advantages of New Channel.

New Channel facility to Government Mail-boats.

time, adjusted the buoys and adoption of lights; so that I had no difficulty in anticipating the period of decided interruption, and so *warning* the busy and much depending traders of the port. My next immediate care was to request means from the Dock Committee (October 4th, 1838*) to carry out my

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"*Marine Surveyor's Office, Oct.* 4, 1838.

Report to Dock Committee of October, 1838.

*"The Marine Surveyor submits to the Dock Committee a Plan of the New Channel region, comprising the channels, banks, and shallows, for five miles upon every point of the compass from the bar of the New Channel; lateral and transverse Sections of that Bar; and a Chart, exhibiting, at one view, the amount of changes which have taken place in an interval of four years, viz. between the Autumn of 1834 and the present Autumn.

"The object and import of these documents is to show, that unless artificial means are forthwith resorted to, the Port cannot continue accessible at low-water periods.

"The New Channel has been navigated with most valuable success for those four years, and even up to last August, 1400 passages per month were effected through it; and tidal detentions of her Majesty's Mail-boats reduced from 261 cases in a year to 10! Such free and vitally important intercourse must *now* be subject to a slight restriction, and will assuredly cease to exist at all if left to itself. The *first* formation and *trend* of this Channel predicted, however, the changes which, from time to time, have been detected, reported, and *provided* for; and have led to that close and simultaneous scrutiny of the whole tidal range in Liverpool Bay, in order to detect any opening which *might* be taking place whilst the crisis (apprehended this Autumn) of the first entrance to the New Channel '*sanding up.*' Every square yard of the region was therefore surveyed and gauged, by the Marine Surveyor, last June; when, so far from discovering even a *promise* of a compensating clearance through the swatches of Burbo or Formby Flats, even the Rock Channel evidences a progressive choking-up. No where, in fact, does any thing present itself which, even by argument, can divest our whole *attention*, and *energies, and* MEANS, from being dedicated to what remains of the 'New Channel'; and those remaining and altered features evince every disposition of the stream of ebb to assume a *natural* and, therefore, permanent course. It should be reverted to, that this Channel first opened at nearly *right angles* to the course of the reflux column of water; a perversity, which has aggravated itself each succeeding year, until the once parallel-sided channel becomes a crescent figure, with its horns pointing to the predominant stream. The concave part of the crescent is bounded by the southern edge of Little Burbo, which constitutes the north margin of the Channel—where the tide has so bored and scooped, as to produce in its consequent deflection a progressive deposit round upon its south-western horn, which has spread the original bar to thrice its breadth, and contracted the passage *over it* from ⅔rds of a mile to ⅓th; and this contraction is unfortunately progressing at a much quicker rate than the unassisted scooping and scouring of the tide upon Little Burbo proceeds: so that, in about six months, it is most certain a ridge of only 7 feet water will *unite* right across the present New Channel entrance—assuredly leaving us, for an indefinite period, shut up for four hours out of every twelve. It is to avert such a calamity to this busy Port, and avail of the

Review of the New Channel and surrounding feature.

Inferences.

proposed undertaking, of *forcing another* entrance into the body of the New Channel—pointing out

intervening mouths, that the Marine Surveyor suggests and urges an immediate dredging or harrowing process at the bight of the crescent already produced by the direct set of tide. A measure not only justified by having patiently refrained from exerting artificial means, but peculiarly invited and encouraged by the present process of nature, and the under-water features within and without that bight. In the former, we have the fact of Little Burbo Bank receding a quarter of a mile, and lowering its surface 7 feet *by tidal influence alone*. In the latter, we have an inner pool of water ready to unite with an outer sea, from their relative beds, which beds incline from *in* to *out* 43 feet in a mile, and are only intervened by a ridge of sand of 1300 yards by 600, and of 4 to 6 feet in height between the 12 feet draught line of navigable waters. From the succession of flats and spits which are growing and outlaying the original *embouchure* of the New Channel, and the evidence we have of the treacherous effects of tide thereon, it would be futile and endless to attempt its restoration; but in the space marked on the plan, in red, A, B, C, D, and the trend of ebb, shown by arrows,—a sudden transit into a muddy dyke of 25, 35, and 43 feet water, at low-water,—presents an invitation, and justifies the prospect of a better channel than ever into the port; inasmuch, that it will be upon a fairer trend up to the docks; a truer course of tide, and from the great and constant depth directly *outside*, will not be restricted to a production of 12 feet water; for why should it cease until the 24 feet bed *within* is continuous with the 24 feet without?

Argument for, and hopes of restoring so vitally important an avenue.

"The most simple and economical means (without trenching upon any patented plan) which occur to the Marine Surveyor, for producing the connexion of a twelve-foot column of water at low springs is by towing the spiked and starred chains submitted in model. * * * * The steamer's work will be confined to 7-day courses at this season, that being the number of days of alternate weeks which produce an ebb tide during day-light. The process would be commenced at H.W. and continue till the fifth-hour ebb, dropping the harrow (or harrows) with a buoy to it, wherever it might happen to be at the stated hour. The period of low-water would then be appropriated to gauging the section, to ascertain progress. The tide averages a rate across the ridge of 2 miles per hour, a promising power for carrying off all we disturb; and as none of the sand would be disturbed within an hour of low-water, the *flood* will not have any additional matter suspended in *its* course, whilst all that *does* go out on the ebb will have ample depth to deposit in upon that particular line. Supposing then that we deepen the area 6 inches every alternate 7 days, it would occupy twelve of those intervals to deepen the desired 6 feet, making 84 days' hire of a steamer between the 15th inst. and the 31st of March, which, at £8 per day, would cost £672; which, added to the denoting buoyage and cost of scraping-machine, will amount to £854.

Means proposed for effecting the object.

"Anticipating a successful issue to the proposition, (which will manifest itself one way or the other in the first month's essay,) the Marine Surveyor next submits his mode of rendering the New Cut navigable by leading lights and buoys.

Mode of rendering the *New Cut* navigable by Lights.

"The Committee will perceive, on applying the detached drawing of the prospective Channel to the existing one, that the Formby *Shore* Light can no longer be subservient to a leading line. It will be shown directly how even with the present bar, its operation is too undefined for low-water periods. It is therefore a consequence, that the present Light-house would have to be abandoned; to prepare for which, he proposes another, either upon Crosby Point or upon that high part of Formby

the line of direction of another lighthouse, either upon Formby Bank or Crosby Land—and mooring the Formby Floating Light a little southward on the

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Bank lying one mile towards the Light-vessel. This bank dries up 10 feet above low-water level; and besides being nearer the mariner's eye, and so much clearer of the local miasma, would be on more independent ground. The Marine Surveyor submits a plan of an Iron Lighthouse, drawn under his direction, and estimated at £2050; but if Baltic timber were substituted, £1700. Such a Lighthouse could be *moved* to another site in a month. Mr. Mitchell foregoes, in this instance, the 500 guineas' fee which the Trinity Board have given him for his Patent-screw Application in building a Lighthouse for them on the Maplin Sand. Should the main land be preferred by Committee, an elevation and ground plan, obtained by the Marine Surveyor, is also submitted; which will cost, including the fences and outbuildings, £1350, the ground rent depending on bargain. In neither of these estimates are the lighting fitments included, as they will be easily transferred.

Proposed Lights.

"These considerations will not be considered premature when, if the success of our New Cut is evidenced in a month, the Lighthouse must be *commenced*. Mr. Tomkinson, who drew the plans according to the Marine Surveyor's dimensions, likewise undertakes to have it completed in four months.

Propositions for averting accidents, and reasons for interdicting Low-water intercourse during the winter of 1838.

"The Marine Surveyor has now to request Committee's attention to an immediate exigency. The Formby Light-vessel's berth is so encroached upon by the breakers of Taylor's Bank, as to require moving for safety; and as the sanding-up of the Half-tide Swatchway has also taken place, and another Swatchway opened its breadth westward, it is proposed to move the vessel ⅓rd of a mile W.¾N. of her present site. Her application then, and the necessity of announcing the present bar not approachable during low-water springs, and the moving certain buoys, are all set forth in a proposed advertisement herewith submitted. And, in order that the present state of that navigation may be understood, and, conjointly with the Chart of last year, the Channel and approaches made the most of, it is suggested that a lithographic copy of the drawing, exhibiting that region, may be issued with the notices: the cost will be only fourpence a-piece, whilst the act will be replete with information to the meanest capacity.

Reiterated protest against casting Dock mud into the River.

"The Marine Surveyor having, in his recent survey, detected the presence of *mud* where sand existed, and as the Committee will detect, at a glance of the comparative shoals and banks of 1834 & 38, the extensive growth of those deposits, he cannot refrain from again entreating that so unjustifiable an aggravation to the growth of our almost overwhelming shoals, as casting the Dock mud into the river really is, may be discontinued. The Dock Surveyor states that it amounts to 96,000 cubic yards yearly: a later information says 66,000. Another mode was proposed, and lodged with the Dock Surveyor by the Marine Surveyor in December last, pursuant to a conference ordered by the Committee.

"In conclusion, the Marine Surveyor cannot help expressing a conviction, that a better Channel than ever is within our reach; and should his simple assurance impart but half of the confidence to the Dock Trustees, which his proving to them the actual state of the Port's approaches on this day four years did, he shall congratulate the continued devotion of his energies to the cause.

"H. M. DENHAM, Marine-Surveyor to the Port.

"*To the Committee of Dock Trustees, Liverpool.*"

line of Rock Lighthouse—so as to preserve the original sailing mark through the Half-tide Swatchway, whilst superseding the Formby Shore Light, and hitherto entrance to the New Channel, by April, 1839. I commenced the undertaking November 16th, 1838, and by the 29th of December following, had accomplished one-third of it. Delays, over which I had no control, deprived the mariner of its advantages until the winter set in; it was the 10th of October following 'ere announced as available by lights and buoys; or *I* could add it to the successful results of surveys and planning, emanating from my six-years' sojourn almost wholly amongst the banks in Liverpool Bay; at length, however, on the very ground where their *first* fruits were manifested in 1833, the *last* fruits of my efforts were destined to be reaped. There *are* those who heartily participate in my proud satisfaction at thus designing a *revival* of low-water intercourse with the Mersey. The *early* tidal hours of this new cut can only be availed of by coasters, and craft under 11 feet draft; such will have directed a keen eye towards it whilst in progress, and familiarly profit by it accordingly: they need scarcely be told that it is literally *the* New Channel, with a fresh *entrance*, trending S.E. by E.$\frac{1}{2}$E. that being the bearing of the *present* line of lights, *(bright afloat, red ashore,)* with three black nun buoys on the north-eastern hand, and four red can buoys on the south-western hand. The Bell Beacon lies *on the line;* the bar is $\frac{3}{4}$ of a mile inside of her, with 11 feet low-water ordinary springs, or 9 feet equinoctial springs.

Commencement and interruption of progress.

Progress delayed.

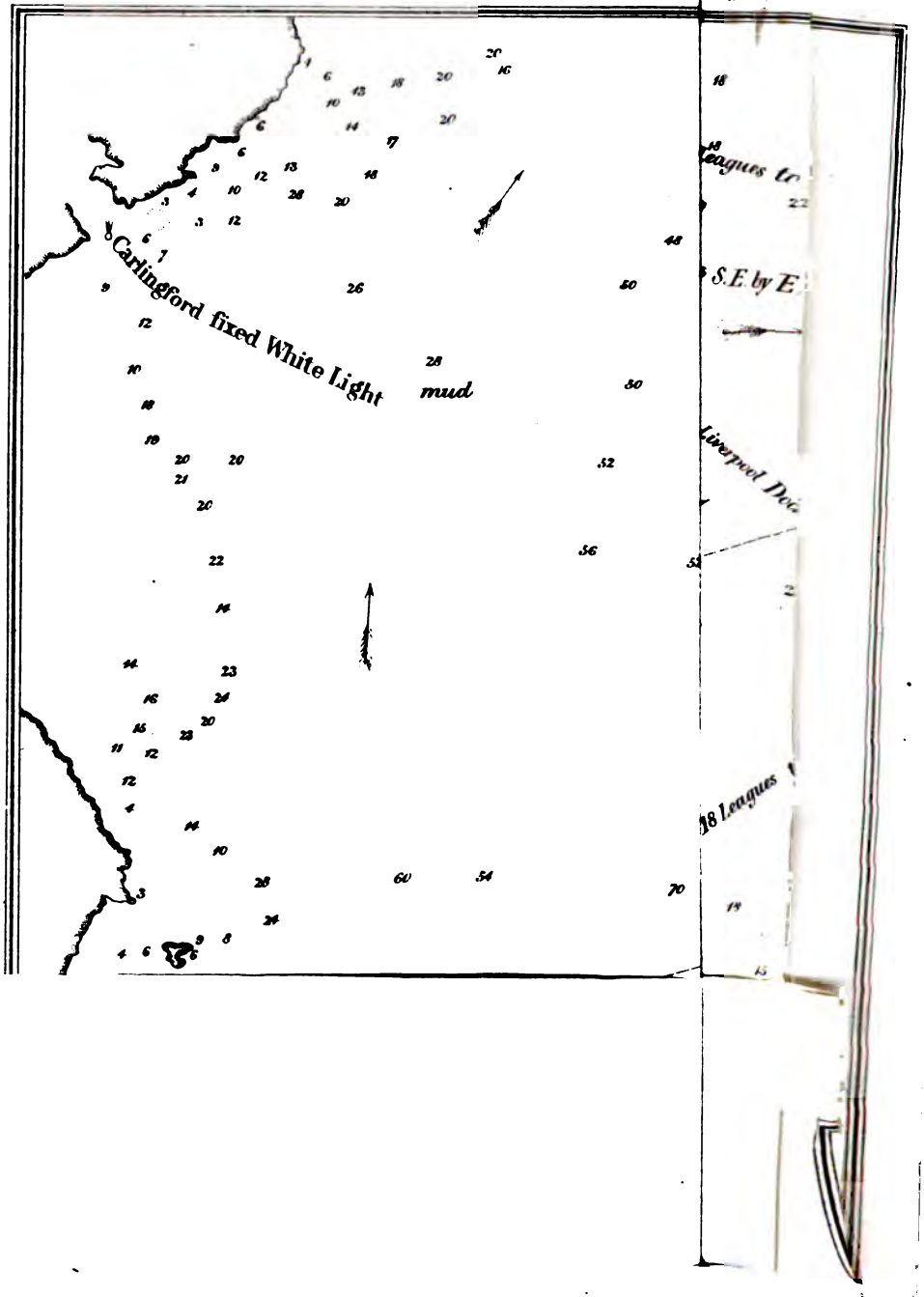
Coincidence of *first* and *last* fruits of my Surveys in Liverpool Bay.

Capacity of New Cut into New Channel, and mode of Lighting and Buoying it.

In the mean time, having brought arrivals from the northward, by progressively picking up the lights and leading objects, I must return, with precautionary hints, to the long voyagers from the westward, to whom any foresight or clue to refuge, after leaving Point Lynas, will be acceptable. It is quite clear every avenue into the Mersey, even the New Cut, is shut against a ship of 18 feet draught until nearly half-flood, *in a gale of wind,* allowing her but 6 feet to *send* in. The awful consequences of *the January* storm (1839) upon ships which bore up promiscuously from off Point Lynas, yawing about for the Light-ship; *too early* upon tide for crossing the spits or taking the earliest channels, affords a too memorable and fatal proof of how it behoves the mariner to calmly throw his mind's-eye in advance, ere he shapes his course upon a short run, before a flying gale and surge, towards a bay of banks; the finger-post of which may be torn away by the very blast which is urging *him.* I suppose a case of a homeward-bound ship off Point Lynas, or of outward-bounders having got so far, when a sudden Westerly gale defies holding their own; it is early in the night, or on a falling day; let it be two hours on either side of high water, and she will be *forced up* at a time when the channels *are* CLOSED. Without considering this, however, the ship's head has been directed for the Light-ship station—all eyes are on the look-out, not depending on vague reckoning, or venturing to round-to for a cast of the lead—time of run agrees —she *ought* to be traced—Point of Air *was seen*

Vital considerations if forced from Westward.

Periods when bearing up for Liverpool Bay a rashness.


Carlingford fixed White Light
mud
S.E. by E
Liverpool
18 Leagues

and MASKED. Alas! the Light-ship has parted from her moorings! The distressed, despairing voyager clings to Hope, for 'tis too late to haul *northward,* and is only convinced of the appalling fact, when in the breakers of Burbo Banks, in the bight of Liverpool Bay.* Now, allowing *running* to be inevitable in the case I assume, and a too frequent one; I would propose your shaping a course from Point Lynas (supposing you cannot stand the beam sea on the course of N.byE.¾E. 15 leagues, for Douglas, Isleman) of E.byN.½N. for Walney Light, 7 leagues more run than to Liverpool Light-ship, situated at the extremity of the North arm of Lancaster Bay, and well known as "Piel-a-Foudre," a *bright intermittent light* of 5-minute intervals; or, if first tempted to run towards Light-ship, by all means haul up upon a N.E.¼E. course, if you do not discern the Light-ship on passing the eastern limits S.E.byS.† of Point of Air Light; a fact which assures you you are *within* her range, and ought to see her lights *if at her station.* By such decision, even under bare poles, if not able to show a stay-sail, you give yourself a certain offing, a 56-mile run to eke out the night, and bring about chosen tide-time, a chance of clearing Anglesea on the other tack, if the wind, as usual, flies to the northward; or, a choice of two refuges when Walney Light rises to view, which should be in 30 miles run from the last point of departure on

Consequences of bearing up. *Cut away Masts,* and down both Anchors.

Proposed course from Point Lynas.

Your being within N.W. Light-ship's range indicated.

How to act.

* Would that the mariner had less reluctance about *cutting away his masts,—then* his ground-tackle would have a chance.—North Bank, Jan. 8, 1839!

† The cross bearing for indicating this advance to the E.S.E. by day, is the western shoulder of Voel Nante Hills, "Tal-y-goch," bearing S.¼E. 8 fathoms (sand) alongside.

Resources in a safe run.

N.E.¼E. course, with 13 fathoms, sand; when, if not well acquainted with Piel-a-Foudre, a more complete, sudden, and easily-obtained shelter offers E.¾S. of you, in Wyre Harbour, situated opposite to Walney, at the extremity of the *South* arm of Lancaster Bay, now buoyed and beaconed, and in course of lighting at its mouth, or, turning-point from Lune, and up the two-mile reach to its basin anchorage of 18 & 20 feet water, low-water springs. —*See Chart and Directions in Appendix.*

In the preceding precautionary suggestions I do, as behoves the author of any guidance to mariners, anticipate *an extreme case;* indeed, such a case produced awful catastrophe at the beginning of the year I am writing in, (1839); a vivid recollection of which will ever cling to those who "occupy their business in great waters," as it *should* ever stimulate the guardians of the port to avert. In ordinary cases of pressing wind from west and north-west, the coast objects and lights would be cleared of mist or smoke, and well defined; south-west winds chiefly carrying a drift of mist, so that should any accident—such as fire, being run down, or parting —occur to Light-ship, the *Sea-lights* of Leasowe and Bidston, checked by the *lower* Hoylake Light, would, on a faithful course of E.S.E. from Point Lynas being preserved, so as to have cleared the spit and north margin of West Hoyle,* be sufficient to lead you up to the tide-stopping anchorage off Dove, called N.E. Buoy anchorage, from whence you could slip at 4 hours' flood, and carry 21 feet

How to be independent of N.W. Light-ship in clear weather.

* This seven-mile margin, lying parallel to, and within two miles of, the fairway course, is *still* without a Buoy to guard it.—Athabaska!

over the Rock Gut Bar. The gale of January, 1839, was peculiar in force, and consequent height and density of *spoon-drift*, which, like a thin snow-drift, obscured objects of two miles distant; thus, the ships could not avail of the shore leading marks; the *buoys* were submerged by spray, and no Light-ship remained to give departure for *hauling in from*.

How *all* depends on the N.W. Light-ship in *furious* gales.

Taking your case as that of arriving under a *clear* weather-gale, in perfect command of helm, and you have no justification in running otherwise from a good offing, let the Light-ship be there or not, you have given every chance to the pilot tracing and hailing you*; it is clear *half-flood*, and not later

Supposing you, however, under a clear-weather breeze.

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*PILOTS' RULES AND REGULATIONS.

Any person acting as a Pilot in the Port of Liverpool, without a license, to forfeit £20.

Pilots refusing to conduct ships, or assist ships in distress, to forfeit £10, and lose their license.

Masters in coasting trade in ballast, or under the burthen of 100 tons, may pilot their own vessels.

Masters of vessels forcibly taking Pilots beyond the limits of the Port, shall pay a forfeit not exceeding £20, nor less than £5.

Pilots misbehaving to have their license recalled, and if they act afterwards, to be liable to the same penalties as if they were not Pilots.

Vessels liable to pay Pilotage coming into Port, to display a signal for a Pilot, under a penalry of £5.

Reward for Pilots assisting ships in distress, to be settled by the Committee.

Compensation to be made to Pilots for taking vessels out of port which have been forced back, to be fixed by the Committee.

Ships forced back after parting with the Pilot, and piloted out again from Hoylake, to pay one-half the prices.

Every master to give the Pilot a true account of the draught of water of his ship, and Pilot authorised to admeasure.

Pilots to obey the orders of the Harbour and Dock Masters.

The first Pilot-boat on turn at the westward to carry a red and white light horizontally, and the second, third, and fourth, a red light only.

At a meeting of the Committee held on the 20th November, 1835, it was ordered,

That it shall be one of the duties of the Master Pilots to take charge of all outward-bound vessels of 500 tons burthen or upwards, and of all vessels drawing more than 17 feet water.

PILOTAGE.

For British Vessels trading to Foreign Parts.

INWARD.

From the length of the west end of the Great Ormshead, bearing S. by W.

than *high water;* the wind is not *southward* of west, nor *eastward* of north; you will find 21 feet water in the Rock Gut 1 hour on each side of high-water neaps, and 27 feet 1 hour on each side of high-water springs; therefore,

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	₱ FOOT. s.	d.
or before Penman Bachan be shut in with the Great Ormshead, at the rate of	9	0
From the eastward of the Great Ormshead, as above	8	0
From the only House now on Great Helbre Island, bearing S.S.W. by the compass, or shall be piloted from the Road of Hoylake only, or from the Buoy of the Fairway in Formby Channel	4	0
OUTWARD.		
Whether through the Rock or Formby Channel	4	0

No British Vessel, trading to Foreign Parts, inward or outward bound, is to refuse a Pilot; but if such vessel has passed the Brazil Buoy in the Rock Channel, or the Middle Patch Buoy in Formby Channel, or if a Pilot-boat falls in with a vessel in the Narrows of the Channels in stormy weather, that she cannot board her without imminent danger, the Pilot shall then lead the way, and in either case be entitled to such Pilotage as shall be awarded by the Committee at their next meeting.

Alien Vessels pay 3s per foot more than the above Rates.

An Alien Vessel, inward or outward bound, is not to refuse a Pilot, as circumstances are described for English-foreign vessels, as above.

For Coasting Vessels, and those trading to and from Ireland, the Islands of Faro or Ferro, Jersey, Guernsey, Alderney, Sark, and Man.

	₱ FOOT. s.	d.
INWARD.		
From the length of the Great Ormshead, as above, at the rate of	4	6
From the eastward of the Great Ormshead, as above	4	0
From the only House now on Great Helbre Island, bearing S.S.W. by the compass, or shall be piloted from the Road of Hoylake only, or from the Buoy of the Fairway in Formby Channel	2	0
OUTWARD.		
Whether through the Rock or Formby Channel	2	0

No Coasting Vessel to pay for less than 8 feet of water, nor any vessel to pay for odd inches under half a foot. No coasting vessel, inward or outward bound, of the burthen of 100 tons or upwards, (unless she be in ballast,) is to refuse a Pilot, as the master or owner, &c. must pay the full pilotage, if one is offered. No vessel is deemed a coaster, unless she has been six months in that trade.

EXTRA PAY.	₱ DAY. s.	d.
For every day of attendance whilst in the River, except the day of going to sea with such ships or vessels as shall be outward bound, and the day of returning from sea and the day of docking for such as shall be inward bound	5	0
And if the attendance of a Pilot-boat be requested	42	0

The Pilotage from sea into Hoylake is one-half inward; and from Hoylake out to sea, one-half outward.

Notwithstanding the Pilot or the Boat be not employed a whole day, to be paid for a day.

☞ The Pilots' Committee recommend to the merchants, &c. that when a Pilot conducts a ship or vessel into port to their satisfaction, the same Pilot be employed to take the said vessel out again; but if he should be absent on duty, that one belonging to the same boat be employed.

TO PROCEED

INTO THE MERSEY AT NIGHT,

(From the Light-ship Station,)

BY HORSE AND ROCK CHANNELS,

Starting from the Light-ship station, open Bidston, (the high light,) its breadth, or 1° *eastward* of Leasowe Light, (bearing S.E.½S.) and directly the first Hoylake Light opens to view (bearing S. by E.½E.) you are abreast of the Spit Buoy of Hoyle; proceed upon that line until the *second* Hoylake Light opens to view, (bearing south,) which indicates your approach to the *Flats*, whereupon haul southward *for* that light instantly, *crossing* the Bidston and Leasowe Lights; and when they open twice their breadth, or 1° 30' *westward*, steer for them until Hoylake Lights come *in one*, (S.W.¾S.) Here *anchor* if before half flood, if later you will have 20 feet over 'Beggar's Patch'; to avoid fouling its first buoy, however, haul for Rock Light (intermittent red and white) just *before* the Lake Lights come in one; Rock Light should then bear E. by S.¼S.; carry on that course until Leasowe Light suddenly disappears, (S.W.) indicating you are abreast of *West* Wharf, when you must haul *east*, to avoid the shore outlay, and so continue until Bidston, in like manner, disappears, (bearing S.S.W.) when you are abreast of East Wharf, and should steer E.S.E. taking care to pass the Rock Light at two cables' length on the starboard

Bidston open *Eastward* of Leasowe Light.

Bidston open *Westward.*

Checked by Hoylake Light.

West Wharf.

When abreast of East Wharf.

(southern) hand, and hauling *south* immediately the light bears W. by S. You are now in the broad deep waters of the Mersey, running 5 and 6 knots, S. by W. on the flood: supposing you without a pilot, you have no business at *the docks* without one, therefore anchor directly Rock Light bears N. by W. or the two *red* lamps at Clarence Dock entrance (the northern dock) bears S.S.E. a fair position for docking from upon next flood;* but you must be prepared for 10 fathoms at half tide—a furious tide—and the most treacherous holding-ground; you will doubtless *drive* awhile, *but cannot drive ashore,* though should you bring up *at once,* you will find yourself at daylight abreast of Egremont Ferry, on the Cheshire shore, a quarter of a mile from the low-water mark: show a light in the fore rigging, to warn off passing steamers; and if subject to quarantine, a light at main truck. It may

Rounding Rock Light.

Anchorage bearings.

Strong Tide—bad Holding-ground.

Show a Light when brought up.

*DOCK REGULATIONS AND SIGNALS.

All vessels are allowed to enter the docks when signals are *not* hoisted at the respective pierheads, notwithstanding the regulation requiring all vessels to be registered at the Dock-office. But all owners, masters, and consignees are, nevertheless, recommended to register their vessels as expeditiously as possible, in order the better to secure their right of turn to accommodation at the dock quays.

The signals for the several docks are as follow :—

For the Clarence Dock.—A Flag on the south Pier of the entrance into the Half-tide Basin.

For the Prince's Dock.—A Flag on the south Pier of the entrance into the Prince's Dock Basin.

For the George's Dock.—A Flag on the south Pier of the entrance into the George's Dock Basin.

For the Canning Dock.—A Ball on the Pole on the north Pier of the entrance into the Canning Basin.

For the Salthouse Dock.—A Flag on the south Pier of the entrance into the Canning Basin.

For the King's Dock.—A Flag on the north Pier of the entrance into the King's and Queen's Basin.

For the Queen's Dock.—A Flag on the south Pier of the entrance into the King's and Queen's Basin.

For the Queen's Half-tide Dock.—A Flag on the south Pier of the entrance into the Queen's Basin South.

blow so hard in the morning from the northward, as to cause labour and driving,* and no pilot may get at you; you can easily slip, or, watching low-water period, trip and drop up to the excellent holding-ground, and better-sheltered anchorage of *Sloyne*, situated ⅓ of a mile S.S.E. of *Birkenhead* Ferry, a protruding rocky point, presenting a red-stone spired church, directly opposite the south docks of Liverpool. Here the Government Mail-boats lie at moorings; you have only to give *them* a clear berth inside or outside, according to your size.

How to act if driving, with both Anchors a-head as usual.

Sloyne best Anchorage.

AVERAGE WATER OVER THE PRINCIPAL DOCK SILLS AT HIGH-WATER TIMES:

	Springs. Ft.	In.	*Neaps.* Ft.	In.	
Clarence Basin	27	0	19	9	Northern Docks.
Waterloo Dock Lock	26	7	19	3	
Prince's Dock, *North*	25	0	17	8	
Ditto *South*	25	2	17	10	
George's Dock	24	3	17	0	Centre Docks.
Canning Dock	21	4	14	0	
King's Dock	21	4	14	0	
Queen's ½-tide Basin	21	0	13	8	Southern Docks.
Brunswick ½-tide Basin	25	10	18	6	
Brunswick Dock	25	3	18	0	

Victoria & Trafalgar Docks open from Waterloo & Clarence Docks, but river gates are ready for occasional purposes of Victoria Dock.

* £800 worth of the *Screw* Moorings laid down in the Dock-reach of the Mersey, as I recommended in 1836, and since adopted in King-road, Bristol, would mitigate, if not avert, the sad confusion and mischief of ships driving two and three miles, up and down, in front of the docks, upon each flood and ebb of spring-tides, by force of tide alone; so bad is the bottom of the deep straits between Liverpool and Cheshire shore. *Span* Moorings would not hold whilst trapping ship's ground-tackle; but the *Screw* Sinker and Single Pennant Chain, with a swivel and bolt right through the Buoy, would permit of attaching a ship's cable speedily at low-water slack, and certainly secure the *outward*-bounders whilst wind bound, limiting the driving to the first-tide of *inward*-bounders.

Tidal Establishment.

High water upon *full and change*....XIh. 5m.
Equinoctial Springs rise .....XXXIII feet.
Ordinary Springs rise *(above same level)* .....XXX „
Neaps.....XXIII „
(Half-tide level 16½ *feet.)*

Latitude and Longitude of Liverpool.

Latitude, St. Paul's .....53° 24' 39" N.
Longitude..... 2° 59' 30" W.

If, however, you are bound to the quarantine ground,* proceed southward, taking care *not to open*

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*QUARANTINE INSTRUCTIONS TO PILOTS.

All vessels coming from any of the following places are, with their cargoes and all persons on board thereof, to be considered as liable to perform quarantine, viz:

1st. From the Mediterranean.

2nd. From the West Barbary, on the Atlantic Ocean.

3rd. From any port or place in Europe without the Straits of Gibraltar, (except Bordeaux,) having on board any of the following articles, viz., cotton wool, silk, carpets, ostrich feathers, sponge, cotton yarn, mohair yarn, unless the master shall produce to you a certificate or declaration, on oath, made by the owner, shipper, or consignee, (or by some person authorised by any one of them,) attested by the British Consul or Vice-Consul, at the port of shipment; or, if there shall be no Consul or Vice-Consul, by two known British merchants; in which certificate or declaration it shall be stated, either negatively that the said articles are not the growth, produce, or manufacture of Turkey, or of any place in Africa, within the Straits of Gibraltar, or in West Barbary on the Atlantic Ocean, or affirmatively that they are the growth, produce, or manufacture of some other country.

Vessels having on board any cotton or linen rags are liable to quarantine, unless a certificate be produced to show that such rags have been washed, or otherwise cleansed or purified.

4th. From any other port or place from whence her Majesty, by and with the advice of her Privy Council, shall hereafter adjudge and declare it probable that the plague, or any other infectious disease or distemper highly dangerous to the health of her subjects, may be brought.

5th. From any port or place whatsoever, if arriving under any alarming or suspicious circumstances as to infection.

ARTICLE 1.—On boarding any Vessel coming from foreign parts, the master is to give you, as required by law, a written paper, containing a true account of the names of the place and country at which such vessel shall have loaded, and also of all the places at which she shall have touched on the homeward voyage, on pain of forfeiting the sum of one hundred pounds; and if any proclamation or order of her Majesty in Council shall have been made since the departure of the vessel from the

the Rock Light Point (New Brighton) more than a small sail's breadth (¼ of a point, or 2½ degrees) of the intervening point of *Seacombe,* (bearing N.¼E. view, M.) else upon early tide you will trail upon 'Pluckington Shelf,' a wicked *accumulating* shelf of sand, stretching, with but 9 feet water, half-way across the river, from and abreast of south docks.* The quarantine ground is conspicuously marked by

Long Clearing Mark for Pluckington and Devil's Banks.

Quarantine Ground.

United Kingdom, or the islands of Guernsey, Jersey, Alderney, Sark, or Man, and shall be then in force, subjecting the vessel to the performance of quarantine, you are required immediately to give notice thereof to the master on forfeiture of the sum of one hundred pounds for any neglect therein; and the master is thereupon required to hoist the proper signal and proceed under your care to the proper quarantine station.

2.—If the vessel shall not be liable to quarantine in respect to the place from whence such vessel comes, the master is to give you a written paper containing a true account of the different articles composing the cargo of such vessel, on pain of forfeiting the sum of fifty pounds. And if the vessel shall have on board any of the articles hereinbefore enumerated, you are immediately to give notice thereof to the master on pain of forfeiting one hundred pounds for any neglect therein, and direct him to hoist the proper signal; and you are then to conduct the vessel to the proper quarantine station. You will also observe, that any vessel which in the course of her voyage has touched at any port or place in the Mediterranean or the Coast of Africa, on the Atlantic Ocean, and has afterwards been admitted to free partique or entry at any port or place in Europe outside the Straits, or in America, is not liable to quarantine unless from having enumerated goods on board without the necessary certificates or declarations, or from having arrived under some suspicious circumstances as to infection.

3.—You are not to conduct any vessel liable to the performance of quarantine into any place which is not appointed for the reception of vessels so liable, unless compelled thereto by stress of weather, adverse winds, or accidents of the seas, of which you, as well as the master of such vessel, are to give satisfactory proof, on oath, on pain of forfeiting the sum of two hundred pounds.

4.—You are, on being required by any officer of the Customs authorised to act in the service of quarantine, to bring-to any vessel you may have in charge, to the end that the matter may be interrogated by such officer; and if you shall neglect or refuse to bring-to such vessel, as soon as it can be done with safety, in obedience to such requisition, you shall for every such offence forfeit the sum of one hundred pounds.

5.—You are to remain on board the vessel in which you are acting as pilot when liable to quarantine, in the same manner as any of the officers, crew, or passengers; and not to quit it before or after the arrival, either by going on shore, or by going on board any other vessel or boat with intent to go on shore, until the vessel is regularly discharged from quarantine, unless by permission of the superintendent of quarantine, on forfeiture of the sum of three hundred pounds, and six months' imprisonment.

* *Vide* Plan and Report in Appendix.

a crescent of hulks, situated 1½ mile, S. by E.¼.E. of Birkenhead, in 7 fathoms clean holding-ground. Vessels generally anchor immediately *eastward* of the hulks; at all events you must attend to the clearing marks just given, as it equally applies to the 'Devil's Bank,' a ridge of sand which dries up 3 feet, *nearly* joins, and fast approaching Pluckington Shelf, and lies one-third the whole width of river, from the Liverpool side, on line of *West Dingle Point* and *New Ferry*. A 4 or 5-fathom channel of 1-6th of a mile wide runs eastward of this bank, lateral with the eastern shore from *Dingle Point*, (1 mile above docks,) *Otterspool*, (1¼ mile further,) and to *Garston*, a mile further; whilst a western, but narrower and shoaler branch, takes up close in shore, past *Brombro' Pil* to *Eastham Ferry*. No *low-water* navigation, even for flats, can be said to exist above a line drawn from Garston to Eastham, and though the high-water shores of the Mersey widens here to 2½ miles, the Eastham Sands and Devil's Bank occupy the space, so as to leave but the deep-water '*Cul de sac*' ground for ships of burthen,* and the two branches alluded to along the two margins; and they are only approachable at low water for flats, coasters, and ferry steamers, on account of the bar-connexion of Devil's Spit with Pluckington Shelf on the eastern side, (10 feet at

Extent of Devil's Bank.

Eastern branch of Mersey.

Western branch.

Southern limits of Low-water Tidal Channels, and Upper Anchorage room.

* It is in the southern portion of this deep-water bight, one mile from any shore or resorted anchorage, and out of the track of vessels passing up the river, that I proposed mooring the Floating Magazines, when requested by Town Council to point out what best to do with the Powder Depôt if removing it from Liscard, on the Cheshire shore. I furnished the estimates, and enumerated the facilities to shipping, freedom from alarm, &c.

low water,) and a similar bar-connexion of Eastham Spit and Brombro' Pil upon the western side, of only 6 feet water. Should you *part* from either of the anchorages mentioned, and have to traverse the space of river about and northward of the quarantine ground, under staysail, upon a weather tide, you are not only kept clear of the Pluckington and Devil's Bank, by the mark given M, but you are assured of being northward (at this date) of the Devil's Spit, whilst St. John-the-Baptist's Church, (high red-stone spired, at south end of Liverpool town,) and the white Lower Park Mill, are *not open* southward—the *clearing* mark is *their being in one*, (E.N.E.) view N. And should you be *anchorless*, '*Tranmere Bight*,' just south of Birkenhead Point, affords a flat mud layer. Detail explanations of the region above Rock Lighthouse, swarming, as it does, with hovelling-boats and ferrying steam-boats, besides within pilot reach, would be assuming the almost impossible case of a *stranger being adrift in it*, and left to depend on sailing directions and local description. My chief object is to bring the stranger, who may be driven up, and have *missed* the pilot-boats, into *port-anchorage*, with Chart and Book, by *night* as well as day. I therefore return to the Light-ship station to do so, through the *northern* channels, as I hope to have done by this *southern*, in-shore and safer route.

Cross Mark for clearing Devil's Spit.

If Anchorless, how to act.

In *moderate* weather the Rock Channel must (whilst the New Channel is *kept* open at both ends) be considered as *second* in point of early intercourse

Comparative views taken of the Southern and Northern Entrances to the Mersey.

with the Mersey; but to the weather-driven, night-arriving, self-piloting mariner, it has been here introduced, and must be recommended *first in order*, being attended with less risk to life than might result from wild steerage and casualties consequent on scudding into a passage of but ⅓ of a mile wide, the *bar* to which receives the shock of accumulated swell right across the Irish sea, producing a frightful *break* and under-tow as you are swept onwards by three surges, from 30 to 18 and 11 feet water.

Bar of New Cut remote from shore succour.

Such is the bar of the *New Cut* into the well-known New Channel, situated 4⅓ miles from the nearest land, right in the wind's eye of life-boat succour, even *if* the ship could hold together till daylight, after broaching-to on either margin of the passage; indeed, the momentary shrouding of the leading lights by a flying squall of hail or snow, might be fatal, as *half a point* deviation of course cannot be afforded. Moreover, if, on approaching the bar, you lose sight of the leading lights from any course, you are too far to leeward for a chance of hauling off, so as to weather the dire Burbo Flats on the starboard tack, or the Jordan, Mad Wharf, and Ribble Maze of sands, on the larboard tack. In fact, with the wind at west, you could not hope, after getting up to, and rounding the *Floating* Light of Formby, to *reach up* the Crosby Channel, hauling up 4 points for 6 miles, under close-reefed main top-sail and reefed fore-sail, especially as the southern down draught of the Mersey straits would head you two points as you advanced, notwithstanding the effect of flood tide in your favour.

The comparative chances of safety, by preferring the Horse and Rock Channel track, will be manifest on glancing at the Chart, for, once the sea lights have been brought open their breadth eastward, you cannot—whether bewildered by obscuration of Rock Light,* or unmanagable from carrying away spars, splitting sails, broaching-to, or breaking-off under violent gusts—be stranded farther than 1 mile from the main, (more frequently within a ¼ of a mile,) along which, lighthouse-look-out is ready to watch your necessity—summon assistance—and a life-boat ready to afford it† at either end of the Rock Channel, or down the Horse Channel. Moreover, on your safely rounding the Rock Lighthouse from this channel, you are *at once* under the weather shore for anchoring. The only case, then, that I will anticipate your taking the New Channel direction in a gale of wind is, arriving in Liverpool Bay under a severe north-wester, with an offing of about 5 miles northward of the Light-ship station; her absence has lured you to the north-eastward; so that when you discover the lights from Crosby round to the Hoylake's, 'tis too late to haul southward. Now, to proceed

A case anticipated when the New Channel Passage into the Mersey may be imperative at Night.

* I here repeat it would be *boon* to the mariner navigating the Rock Channel, if a Floating-light was placed upon that part of the Rock Light leading-line (E. by S. ¼ S.), and nearly abreast of R 4 black Buoy; or, a Shore Light, of single reflector-aperture, at, or upon the line of Bootle Water-works chimney. At present, the passage to and fro depends upon a change of single bearings and object (Rock Lighthouse). It being contemplated to place such a subsidiary Light in the Crosby Channel, I have hopes of this being eventually conceded—even a floating bulky beacon would be acceptable.

† *Provided* a Steam-boat is under the premanent and undivided control and direction of the Marine Surveyor of the Port, as I supplicated each year for four years; especially argued as the necessity annually was, prior even to the miserably-aided wrecks of the 7th, 8th, & 9th of Jan. 1839.

INTO THE MERSEY

BY THE

NEW CHANNEL CUT OF 1839,

IN A GALE AT N.W. AT NIGHT.

Conclusive arguments of position, and how to act.

YOU are not to expect a glimpse of any objects but the *lights*—enough! You positively see the two northern lights of the bay, a steady *red* light, *higher* than the floating bright light; you dare not round-to for a cast of the lead to ascertain how far you are outside the bar; you are flying over the ground upon a succession of crested seas; the *red* light is the *distant* one of the two; *that* decides *which* way you must yaw to bring the lights *one over the other*—it is done—they bear S.E by E.½E. that clinches the question.

Rise of Tide and *send* of Sea considered.

You are satisfied the rise of tide, allowing 6 or 8 feet 'send,' accords with your draft. All now depends on a well-trimmed storm canvas—faithful helmsmen—and your SO CUNNING her as to inspire those hardy fellows at helm and look-out with the calm, *firm* confidence you feel yourself.*

* I cannot commit such hints for vital exigency to paper, without fancying myself at the elbow of the intensely anxious mariner, whilst jumping down to his cabin light—or between the lurches and flying quarter seas—he scans the page at his binnacle lamp. If he believes in the fruits of my experience, and gives me credit for the solicitude which prompts the desire to be of service in the hour of need, he will forgive my whispering to his almost scared senses, how even a forlorn hope depends upon the *voice* as well as countenance of the commander—on the very *tone* in which, '*Very well* THUS!'—'STEADY, SO!'—'Now we have it, my boys!'—or how one *faltering* order, or exclaiming, *Starboard—Port—Where are the lights?—What shall we do?*—all in a breath, has paralysed the hardiest crew, whose wistful alacrity brought the tottering bark to the *threshold* of hope. All *then* is dismay and fruitless anguish.

You have brought the leading lights *a-head*, S.E. by E.$\frac{1}{2}$E. A bulky frame-work Floating Bell Beacon lies (unluckily for *night* intercourse) *upon* the fairway line, $\frac{3}{4}$ of a mile outside the bar; it is well to say *keep clear of it;* but it is hit or miss, in utter darkness of night and storm; the beacon gets the worst of it, at the expense of your copper. The sea running in a more regular trough will be the chief indication of your being within the bar,* and, as the distance to the Floating Light is but 2 miles, you are approaching so rapidly, that all attention must be alive to your starboard helm, to sheer north-eastward of her as you near upon the line, and then *port* helm for rounding up 4 points; you will be prepared for doing so by opening the lights sufficiently eastward when you observe the farthest and red light become the *lowest* of the two; on rounding this Floating Light close on your starboard beam, steer S.S.E.$\frac{3}{4}$E. The Rock Light (revolving red and white) ought now to be just over your starboard fore-chains, and the Formby Floating Light, just passed, right astern, bearing N.N.W.$\frac{3}{4}$W.; keep an eye also over your larboard beam on Crosby Light, and by the time you have run 3 miles, it will disappear, (bearing N.E. by E.$\frac{3}{4}$E.) telling you to haul 1$\frac{1}{2}$ point more southward,† (S. by E.$\frac{1}{4}$E.) when the Rock Light should be kept over the starboard cat-head; *preserve* this course until the Rock Light draws upon your starboard beam, (3

Clear the Bell Beacon if you can,—she lies *on* your course.

Approaching Formby Light-vessel.

Mind how you *round* her.

Course and bearings from her.

When to haul up more.

* Leasowe Light bearing any thing *westward* of south—if attention can be spared over the starboard beam—also indicates you are over and inside the bar.

† A subsidiary Floating-light is contemplated here.

miles more run;) coax up to the western shore, and anchor as close to it as the depth and rise of tide agrees with your draft; the sooner the better, to avoid drifting into some ship's hawse, and when brought up, show a light at the fore-stay or rigging; don't spare the cable, or begrudge letting go a second anchor as soon as the first is well down, for the ground is steep, and very bad for 'bringing-up.'

When to Anchor.

Don't spare the second Anchor.

The New Channel considered in moderate weather.

Having given the preference to the Horse and Rock Channel approach into the Mersey, under circumstances which would render the resorting to the New Channel entrance little better than a *forlorn hope*, thereby *second* in order, I will now describe, and endeavour to place it *first* in order for the mariner's study and adoption, under ordinary states of weather, because it is not only the most *simple* track into the Mersey, but the *earliest* by 9 feet water, there being but 2 feet through the Rock Gut, *when* 11 feet may be carried into the New Channel of 1834, by my projected entrance of 1838; consequently, at *low-water neaps*, or first-quarter flood on springs, you have 20 feet water, giving 3 hours' advantage over the Rock Channel. As, however, this volume of Remarks and Sailing Directions, with compressed Chart, &c. are prepared (like my large local scale Charts of 4 inches to the mile, of 1833-35-37-38, were) for not only the homeward bounder pressing forward under a clear fair wind, which can present but few instances of want of pilot; but to meet the instant necessity which so frequently occurs, viz. ships having proceeded on the ebb to sea, and a fierce north-wester

Comparative tidal advantages of the New Channel.

Outward bounders met by shift of wind at the Sand-heads—

springing up on the flood, *after the pilot had left her;* your alternative is either to flog at it whilst your spars can receive support from new rigging, (which generally ends in disaster,*) or run back on the flood. The commander of a ship must then depend on previous knowledge of the navigation, or what he can scan from Chart and Book. In anticipation then, of all possible cases, and allowing but one in a hundred may *require* it, I am justified in returning to a brief description of the coast objects, that can apply to whatever channel he decides upon taking, with reference to wind and his draft of water. I suppose him at least as far westward as the N.W. Light-ship station, and take it, of course, that he has placed Chart and Book on the capstan-head, acquainting himself as to the relative position of coast feature and objects, so that when called into operation, their identity may be sudden and *convincing*. I first then invite your eye to the *southward*, where nearly south of the Light-ship, and towards the eastern side of the open space forming the Dee estuary, lies in fore-shortened appearance, [see view J, in Appendix,] *Helbre Island*, based upon the sand and mud shelf which outstretches from *Helbre Point* 1 mile W.N.W. with rocky perpendicular cliff of 40 feet height; surmounted by a telegraph, which communicates with Bidston station. Helbre Point is the low sand-

New Rigging —strange crew —Pilot left.

Case depends on Chart and Book.

Appearance of Coast objects from N.W. Light-ship station.

Helbre Island.

Helbre Point.

* Unhappily for the commander under such circumstances, all his skill and ship's capability of clawing-off is baffled by a custom of shipping or receiving a new crew *on hauling out of dock*, thus strangers to each other, and the ship's gear; and so far from disciplined, scarcely out of their cups. What but bearing up is to be expected?

hill elbow which forms the north-western angle of Cheshire.*

Back-ground objects.

In carrying the eye eastward from Helbre Point, those features and coast objects which come into application as leading marks, or for identifying your

Irby Hill and Wood.

position, are *Irby Hill and Wood,* 1½ mile S.S.E. of Grange; then *Wood Church,* (square towered,) 2

Bidston Hill, Mill and Lighthouse.

miles east of *it;* then Bidston Hill—mill and lighthouse—rising 244 feet above half-tide mark; and finally on same trend, as *back* ground to the

Wallasey Church.

shore-objects, the high ground of Wallasey Church and Mill, 1⅓ mile farther: whilst the *fore* ground

Fore-ground objects.

presents, first, Hoylake Hotel, a bulky brick build-

Hoylake Hotel.

ing, latterly whitewashed, ⅓ of a mile eastward, on line of shore from Helbre Point; then, with intervening terrace of cottages, the two thick-set looking

Hoylake Lighthouses.

towers of *Hoylake Lighthouses,* ⅓ a mile farther, trending obliquely with the shore S.W.¾S. ¼ mile apart; the lower one close to high-water mark, and

Life-boat-house.

both white,† with the life-boat-house directly under, containing two boat berths,‡ and belonging to

Hoylake Church.

Liverpool Dock Trust. A belfry'd church appears ¼ of a mile eastward, then the two diamond-topped

Dove Beacons.

poles, called Dove Beacons, standing a cable apart,

* The frame-work Beacons (called Helbre Marks) for leading up Helbre Swash, present themselves S.¼E. of each other, on the space between Helbre Island and the Point, Prior to 1834, they stood *upon* the island, but at my suggestion they were removed in that year; the inner one to the eye-islet, and the outer to the beach, affording a sensitive transit and *direct* line.—Bar has twisted—*shift outer mark Eastward.*

† Instead of brick colour, at my suggestion, 1835, whereby they make-out on the dark back ground of Irby when in the bay.

‡ Erected in 1837, at my suggestion, to afford two boats of different capacity, to be launched according to the situation of the ship in distress, or *both* in emergency; to give due effect to which, there should be *two crews.* And *here* (Hoylake) should be moored the duplicate Light-ship and LIFE-BOAT STEAMER.

upon a S. by E. line of each other,* and one mile eastward of Hoylake Lower Lighthouse; then the tall bulky white tower of Leasowe Lighthouse, a little within the embankment, 1½ mile farther eastward, with Leasowe Castle ¾ of a mile in advance, on same line of shore, all embraced in relative position in view D, (Appendix). The Rock Lighthouse, an Eddystone-looking building—Fort—Red and Yellow-nose cliffs, and blocks of white houses at New Brighton, terminate, in a clustered view, the 6½ miles range of coast, [see view F, Appendix,] skirted by a continuous sand beach the whole way, outlaying, in some parts, more than ½ a mile. The *upper* part of the beach, however, close to high-water mark, between Leasowe Castle and Hoylake, is to all *appearance rock-bound;* it will, therefore, much relieve the suspense of those who may be drifting on it as a lee-shore, either by parting of cables or being disabled, to understand that instead of *rock*, it is a layer of soft peat mud, well calculated to bed a ship, instead of bilging and breaking up.

Leasowe Lighthouse.

Leasowe Castle.

Rock Lighthouse and Fort—Red and Yellow-nose Cliffs—New Brighton Houses, &c.

An alarming-looking, but favourable layer for beaching.

The eye, resting for an instant on the Rock Lighthouse, (from whence springs the western arm of Liverpool Bay,) takes up the only rising ground of Liverpool which prevailing winds permit your seeing, on account of its smoke-drift; that shoulder of land is called Walton, surmounted by a dark square-towered church, 1¼ mile inland, elevated 219 feet above mean-tide level, and situated 2¾ miles

The eye tracing the Northern Arm of the Bay.

Walton.

* So placed at my suggestion in 1835, to lead between Dove Spit and S.E. elbow of East Hoyle, coming out or going into Hoylake by eastern entrance.

E.S.E. of the Rock Light, right across the mouth of the Mersey; and on that line, nearly, stands upon the slope and flat towards high-water mark, first,

Bootle Marks.

the diamond-topped frame work called *Inner Bootle Mark*, then, the tall chimney of Bootle Water Works, and, ultimately, upon the actual beach, 1¾ miles northward of the docks, the two remarkable and well-proportioned white (striped black) obelisks, known as the *Bootle-shore Marks*, [see drawing in Appendix,] contrasted by the stunted double-towered brick church of Bootle, close within high-water mark. From Walton-land a continued flat stretches northward for 8 miles, supported (but rendering undefined than throwing it out) by the faint black ground of Ormskirk; this flat forms the northern arm of the Bay, and with its outlying strand, gives marginal trend to the bulk of the

Seaforth and Waterloo.

Mersey, seaward, down from the straits. Groups of houses are dotted along the flat for one mile on either side of the Bootle Obelisks, within which rises the tower of Seaforth Church, (octagonal and yellow,) terminating in a terrace, called *Waterloo*, at the high-water mark two miles from the obelisks, and, altogether, 3½ miles from the town and docks,

Crosby Mill and Church.

[see view G, in Appendix]. At 1 mile north of Waterloo houses, and 1½ mile within the margin of sand-hills which form the coast line, overtops the white mill and flyers of Crosby, with the dark-towered church, immediately outside, or westward of it; nothing then arrests your eye, as it ranges northward, but Ince Plantation, until it rests upon

Crosby Lighthouse, and

Crosby Lighthouse, situated 2½ miles north of

Waterloo-terrace, described in page 8, and shown in Appendix. Then, the well-known object, Formby S.E Mark,* a lofty brick column, 1½ mile north-eastward of the lighthouse; and lastly, on this promontory, visible from the offing, the frame-work beacon, called *Formby North-west Mark*, erected close to the life-boat house, on western projection of Formby, 1⅛ mile N.W.½N. of the S.E. Mark; the coast-line rounds gradually to the north-eastward, from this N.W. Mark, presenting, in the western aspect, a termination of sand-hills 1 mile further northward [see view A, in Appendix]. When, well advanced in the bay, or at the New Channel entrance, at good lift of tide, the flyers of the highest of two mills, and belfry of Formby Church, overtops the sand-hills from the village, about 2 miles inland, bearing east of the N.W. Mark. Hoping to have traced out the *coast* feature comprising your ground of observation, and familiarized the several objects to anxious comprehension, I propose your patiently following me into a brief sketch of the *channel* feature and relative *buoyage*, before proceeding to navigate yourself through either of the two routes into port; for, I shall not have accomplished my task, to my own satisfaction at least, until, by anticipating every position and exigency that can attend the mariner, I enable *him* of pains-taking zeal and conception, to bring his ship into port under all the variety of wind,

Formby S.E. Mark.

Formby N.W. Mark and Life-boat House.

Formby Mills and Church.

* Rendered a Lighthouse in 1834, at my suggestion, and so acted until October, 1839; when its *light* was superseded by Crosby Lighthouse, as proposed by me, October 4th, 1838, but preserved as a day object.

weather, and tidal stages, which the region I am treating of, is subject to, and which so vast and busy a proportion of our mercantile navy have to avail of, depend on, and struggle with, at this date.

Points argued respecting the Southern and Northern route into Port.

We have done our best under boisterous cases, by both the principal avenues. I assume a *moderate*-weather case *now*, and therefore, with the wind from any quarter, *except* S.S.W. to S.W. you ought to take the New Channel and Crosby track; to do so, under a S.S.W. or S.W. wind, from the vicinity of the Light-ship, would be running wantonly to leeward, then to *beat up* the whole of Crosby reach, the wind there proving no better than *south;* whereas you would *lay-up* the Horse Channel, carry a flowing sheet up the Rock Channel, and be able to haul up for an immediate anchorage in the Mersey, should the ebb have made, or, in four boards would turn up to either of the docks in *time for docking*, if saving high water; the working up Crosby Channel might not do so much, even if not catching the ground in stays on one of the twenty tacks she would have to make; at all events not compensate the entering *earlier* by the New Channel Cut.

As, however, so entering, and thence by Crosby Channel into the Mersey, is to be recommended under *general* circumstances of wind and weather,* on account of the additional 9 feet water already described, I will here revert to the detail features of

* It is true that with S.E. winds you must beat up Crosby; so you would up Horse and Rock with less room, at half tide.

CROSBY CHANNEL & ITS OUTLETS.

THE main trunk of the Mersey waters, and parent of three varying, remote, and, at best, but sadly-inadequate avenues for the vast shipping necessities, and wonted intercourse between open sea and the north of England emporium, (designated in my published survey of November, 1838, "*The Northern Approaches to Liverpool,*") is CROSBY CHANNEL.

Crosby Channel.

This channel springs from the high-water confines or mouth of the Mersey estuary, which the Rock Lighthouse Point and Bootle Shore constitute. It trends directly northward, in line from the impelling straits for 5 miles*, preserving the width of a mile for that distance, between the low-water margins, and retaining an average depth of 7 fathoms. The low-water margin on the *eastern* side is formed by the shore outlay of flat sand and mud, which dries out obliquely than laterally, with the shore of Bootle, Crosby, and Formby, measuring ½ a mile depth off Bootle, ¾ of a mile off Crosby, and (including Taylor's Bank) 3 miles (due west) off Formby S.E. Mark.

Its trend and width.

Its Eastern boundary.

The *western* confine of this channel is formed by that extensive barrier-mass of sand deposit, known as the 'Burbo Banks'; this trend of channel-margin preserves a relative distance across, and reaches on parallel bearing with the eastern margin; it is alike

Its Western boundary.

* 779 million cubical yards per average tide.

Burbo Banks. *steep-to.* Their incline of surface is westward and northward, stretching and shelving 3 miles off into the bay, growing up from the northward in *three, seven, nine, fourteen,* and even *twenty-one* feet above low-water level in various knowls, between which several variable boat-swatches are presented, at the different heights of tide, between half tide and low water; all, however, dry up at low-water springs except two. The whole deviation in the first 5 miles' course of this channel from the Rock Light-house, is not more than 1½ point, viz. from N. by W.¼W. to N.N.W.¾W. down which the tidal stream gradually decreases its rate from 6½ miles to 2½ per hour. But at the sixth mile it is suddenly contracted to ½ a mile, by the rapidly protruding sand, called *Taylor's Bank,* and a knowl hitherto known as *West Middle,* though now may be treated as the *'North-eastern elbow of Burbo,'* to which it has united itself. The last half ebb is here abruptly deflected 2¼ points more westward; the first half ebb bores more northward. But *here* is the radiating point of *three* tidal escapes, viz. the *New Channel* of 1833, (with its new entrance of 1839,) the *Half-tide Swatchway* of 1833, (called by some the Zebra Channel, on account of its white and black striped buoys,) and the *Old Formby Channel.* It was to render these tide escapes navigable by night as well as day, according to rise of tide, that a light-vessel was laid at the converging point off Taylor's Bank in 1834. She is called the FORMBY LIGHT-VESSEL; painted *red,* shows a black ball by day, and exhibits (25 feet above her water-line) one *bright*

Taylor's Bank and West Middle.

Conveying Point of the Northern Channels.

Date of FORMBY LIGHT-VESSEL.

Description.

light, discernible 10 miles off. She is moored in 5 fathoms at low-water springs; is 1½ cable from the nearest shallow, viz. elbow of West Middle, and bears from the Rock Lighthouse, N. by W.½W. 6 miles—from Crosby Lighthouse, N.W. by W.½W. 3½ miles—Formby S.E. Mark, W.½N. 4 miles—Bell Fairway Beacon, S.E. by E.½E. 3 miles—Fairway Buoy, *Half-tide Swatchway*, (HF. Fy.) S. by E.½E. 2⅞ miles—Buoy (F. 4, red) on south entrance of Jordan Bank, rounding into Old Formby Channel, S.W. by W.¾W. 1⅜ mile—Buoy, (C. 1, black) Spit of Taylor's Bank, West, ⅛ mile. A frame-work beacon stands (on the beach) upon the line of, and ⅛ a mile from, Crosby Lighthouse, to detect the Light-vessel driving, and to afford a leading mark up the New Channel Cut when she breaks adrift.

Site.

Bearings and Distances.

A leading-mark Beacon when Vessel is adrift.

The *flood* stream sets from this vessel fairly up S.S.E. except the first quarter, which trends S.E. The ebb stream sets N. by W.¾W. until half ebb, after which N.W. by W. never exceeding 2¾ miles per hour. It is

Set of Tide, and Tidal Establishment at Formby Vessel.

Being half an hour *earlier* than at the docks, and rising 2 feet *less*.

High water upon full and change)	Xh. 35m.	
Equinoctial Springs rise	XXXI feet.	
Ordinary Springs	XXVIII „	Above Equinoctial L. W. Level.
Neaps	XXI „	
Half-tide level of *each* tide	XV½ „	

The principal channel for which this light-vessel was intended, and continues to apply, is, that north-western branch, *known* as the *New Channel;* and when it was delineated by the Admiralty sur-

New Channel, as it was in 1834.

When Lighted.

vey, I was conducting, and forthwith lighted and buoyed, as I suggested in 1834, it presented a parallel-sided passage right up to the Light-vessel, in one with the S.E. Mark, *as a lighthouse*, on the course of E.$\frac{1}{2}$S. It was half a mile wide, and admitted a straight line right up its centre, with 4

Nature of its Bar.

and 5 fathoms water, *after* passing over a bar-ridge of sand, which stretched from spit to spit, at its entrance, (a ridge of only 150 fathoms from outer to inner edge,) but carrying 12 feet at low-water great springs, it became the earliest tide-passage into the port by 3 hours for ships of burthen, and by the steamers availed of night and day, whilst many a ship, upon strong southerly winds, reached through

How it promoted safety even upon *falling* tide.

it, and either *beat up* Crosby Channel upon the last half ebb, or, if too late to carry flood all the way up, secured good sheltered anchorage, if the wind flew south-westward, under the lee of Burbo, before dark, or until return of flood. Again, *outward*-bound vessels availed of the New Channel under *northerly* winds, by turning down Crosby Channel, in good tacking-room, and by three-quarter ebb made *one lay of it* over the bar, upon a W.$\frac{1}{2}$N. course, 2 miles to windward of the N.W. Light-ship, and many miles in advance of those beating down

Declension of New Channel entrance, and precautionary measures reverted to.

the Horse Channel. Thus were 12,000 passages effected per annum, with great advantage, even up to the autumn of 1838, at which time I represented the necessity of interdicting its use by night, or even by day for vessels above 12 feet draft, at low-water periods, viz. from three-quarter ebb to one-quarter flood, as its N.W. and S.E. elbows had over-lapped,

and the whole channel was assuming a crescent figure—with its 6 and 9 feet spits contracting the entrance to a cable width instead of ½ a mile, and the bar reaching and spreading ¾ of a mile, with as little as 10 feet between those spits—the outer buoys could not occupy the extremes of the spits without subjecting them to being run down, so that hitting the deepest water at low water was scarcely possible by day, and quite impossible at night. To do so, however, at quarter flood was of vital importance, and to promote *that,* notices and plans were issued from my surveys and suggestions, dated 13th November, 1838.

Necessity of interdicting Low-water intercourse at Night.

Date of interdiction suggested by me.

Such digression will be excused, if familiarizing the mariner with the NEW CHANNEL *entrance* of 1839, especially as its being locally announced under a distinct name, might induce him to give up valuable attained knowledge of the actual New Channel in the six previous years, *into which* the 'New Cut' (Victoria) leads; formed on the southern hand by the flats of the original bar that trail out from Great Burbo Spit, and on the northern hand by the broken patches that come awash, designated by me, in 1833, as 'Little Burbo,' presenting the very north-western patches which *dry up* at present upon the Crosby trend of ebb, and dipping quickly into 5 and 6 fathoms. The inner two-thirds of the New Channel trends for the S.E. Mark, (E.S.E. and W.N.W.) measuring as much as ½ a mile nearly across the centre third; the south margin trends as formerly, east and west, but the north margin, after showing a disposition to trend

The New Cut (Victoria) identified with the *original* NEW CHANNEL.

obliquely, was, by *harrowing* process, forced upon a N.W. and S.E. trend, until actually through the original spit of Little Burbo. Supposing your eye at the inner or junction-centre with Crosby-reach, the under-water shelf which forms the bar, spreads from W.S.W. to N.W. on a mile and a half radius; what remains of the *first entrance* to this channel comprises a gutter of 10 feet at low springs, $\frac{1}{8}$ of a mile wide, with 9 feet ranging $\frac{1}{2}$ a mile S.E. of it.

Remains of *first* entrance into New Channel.

This gutter entrance trends E.$\frac{1}{4}$N. in continuation of the south side of the channel; a triangular 5 and 6-feet flat, of $\frac{1}{2}$ a mile diameter, lies on the north side of this *old* entrance, dividing it from the *new* entrance; the new cut entrance thus formed on the south-west hand, is margined by *Little Burbo* Spit on the north-east side, presenting a space of

Bar of new entrance.

a $\frac{1}{4}$ of a mile wide by $\frac{3}{8}$ of a mile through; a crescent ridge, sweeping outwards ($\frac{1}{4}$ of a mile deep) from

Soundings up the New Channel.

E.N.E. to W.S.W. constitutes the bar; *eleven* feet low-water ordinary springs, or 9 upon equinoctial ebbs, is afforded over this bar, then 14 feet for $\frac{1}{8}$ of a mile further in, then 4 and 6 fathoms progressively to the inner end of the New Channel; south-eastward of which, $\frac{3}{8}$ of a mile further up, lies the Formby Light-vessel, in 5 fathoms; the whole distance from outer edge of 'New Cut' to the Light-vessel being 2$\frac{1}{4}$ miles, upon the bearing of S.E. by

Buoys on Starboard hand.

E.$\frac{1}{2}$E. Four *red can* buoys, at equal distances, ($\frac{3}{4}$ of a mile,) mark the S.W. side of the channel from entrance to Light-vessel; the three first from seaward are lettered V, and numbered in rotation; the fourth and turning buoy C 1, with a perch.

Three *black nun* buoys mark the N.E. side, lettered V. An opaque conical figure, known as the New Channel Fairway Bell Beacon since 1835, when I laid it; is removed northward, according to my proposition of October, 1838, to assist taking up the fairway line into the New Cut in thick weather; she lies in 6½ fathoms, muddy* bottom, N.E.½E. 4⅕ miles from N.W. Light-ship. If determining in the offing to take this passage in when blowing fresh, you will avoid the ugly sea, caused by a shelf of patches and tongue of sand, with as little as 16 feet in some places, which outstretches 4½ miles W. by N. of the New Channel, (with Helbre Island open westward of N.W. Light-ship,) by bringing Crosby Lighthouse S.E. *before* the Light-ship bears south of you; you will then carry deep water up to the bar. The least water on the course to Bell Beacon from N.W. Light-ship is 17 feet (*sand*), 1 mile from the beacon. But to anticipate such a case of making for the New Channel entrance as I *have observed,* viz. a ship having chosen the *Horse* Channel, with the wind at N.W. finds the ebb making against him by the time he arrives at the buoy of the flats, retarding his rate of sailing, so as to render it doubtful saving water through the Rock Gut; he therefore determines promptly to avail of the New Channel, and hauls right across the bay. It is essential then that he, or indeed any

Buoys on Larboard hand.

Relative position of Bell Beacon.

Shallows intercepting course from N.W. Light-ship.

Be cautious how you haul across the Bay.

How to keep clear of Burbo Flats.

* You cannot be on the fairway track to this channel when northward of the N.W. Light-ship, *unless* your lead shows *mud*, and 8 fathoms water. You may have 8 fathoms and mud 1¼ mile northward of Light-ship, but the 4-fathom tongue of sand will be between you and the fairway of New Cut.

long-legged ship, standing off and on at half-tide or low-water period, be reminded of the off-lying extent of *Burbo Flats*, which shelve out in 9 feet flats, 5 miles westward of the nearest land, (Crosby.)

Turning Marks to clear Burbo Flats.

A ship can only be considered clearly outside (westward) when Bidston Mill is open its breadth westward of Leasowe Castle, S.S.E. [see view H]; and it is not less important his being apprised of a fast-spreading deposit, evidently produced by the confluence of the Horse and New Channels and principal swatches of Burbo, relatively situated about half way between the Light-ship and Burbo Flats; and on being first detected by me, in 1834, was designated the

NEWCOME KNOWL.

It consists of a knowl of sand, ½ a mile long, east and west, by ⅕ of a mile across, having as little as 14 feet upon it at low-water springs; a 3-fathom bed spreads 1 mile E.S.E. and a 3 and 5-fathom bed stretches 1¼ mile W.N.W. A large black nun buoy (K 1) guards the north-western shoulder of the knowl, bearing from the N.W. Light-ship, east, 2 miles, and from the Bell Beacon, S.S.W. 3 miles. The buoy may be passed *close-to* on all sides in 3 fathoms, except the south-eastern. No warning by the lead is afforded on the S.S.W. or N.N.E. approach, being steep-to, but you clear it ¼ of a mile westward in 3½ fathoms, by not closing *Kirby Church* nearer the western side of Hoylake Hotel than a sail's breadth, or 2°, bearing south, whilst the clearing mark for Burbo Flats—Bidston Mill looking with Leasowe Castle—passes midway be-

Clearing-mark Westward.

Leading-mark Eastward.

tween the knowl and flats 4 and 5 fathoms, and the course to Bell Beacon from N.W. Light-ship, viz. N.E.¼E. 4¼ miles, passes 1¼ mile north-westward of the Newcome Knowl in 7 fathoms. Finally, observing that the *direction* of *flood* tide near this knowl is S.E. for the *last four hours*, and *direction* of *ebb* is N.W. for the *first four hours*, the rate not exceeding 2¾ miles per hour, springs, and 1½ per hour, neaps. Your position is sure to be *westward* of the *knowl* so long as you can only see *one* Hoylake Light—the high light *un*-masks ¼ of a mile outside it, bearing south—satisfy yourself as to *bearings* when settling your position by these lights, as powerful and false lights are produced by the smelting-houses, coal-pit engine lights, and large limekilns on the shores of the Dee.

Set of Tide.

Night Clearing-mark.

False Lights make out from the Dee.

Presuming I have anticipated your emergency or inquiries upon every stage of approach, as respects the lights, beacons, and coast feature, it remains to apprise you of the system of *buoyage*, upon which you must *solely* depend in thick weather. The arrangement adopted at my suggestion, and laid by me on the 1st of August, 1835, is continued, and at this date (1839), presents the following order throughout Liverpool Bay, counting and taking up from *seaward:* Red (or quartered red and white) buoys on the starboard hand—Black buoys on the larboard hand—Black and white chequered buoys on intervening dangers—Superior size *can*-buoys, with perches, guard the elbows and spits—Green buoys denote wreck or dredging apparatus, and to be given a berth to. Each buoy bears

General system of *Buoyage* in Liverpool Navigation.

the initial of the channel it belongs to, the figure indicating its number in that division. The distinguishing characters amount to twelve, viz: F. Formby Channel—C, Crosby Channel—HF, Half-tide Swatchway—N, New Channel—H, Horse Channel—R, Rock Channel—HE, Helbre Swatch—B, Beggar's Patch—K, Knowl (Newcome)—V, Victoria (*i.e.* New Cut)—L, Lake (Hoylake)—Fy, Fairway;—for instance, F. Fy, (black nun) denotes the Fairway Buoy of Formby Channel—again, V 1 (black nun) denotes the first buoy of Victoria, (or new entrance into the New Channel,) to be left on the *larboard* hand *going in.*

Distinguishing characters.

Distribution of the Buoys

The buoys are so distributed as not to exceed ¾ of a mile apart, whereby it is scarcely possible, in a fog, to lose one before picking up the succeeding one: to effect this I suggested, and had the satisfaction of adding 20 buoys to the former number.

Considerations when running for Bell Beacon.

Now, in making for the Floating Bell Beacon from the northward or westward, in foggy weather, (even if taking departure from the Light-ship upon the course of N.E.½E. 4¼ miles,) I must remind you that the tide of flood sets S.E. and ebb N.W. and would suggest *steamers* heaving-to for a minute, to catch the sound of the self-acting bell. I have already explained that this beacon lies ¾ of a mile outside the bar of the New Channel Cut; therefore you have only to recollect that the New Channel is marked by 4 *red can*-buoys on the starboard or southern hand, each bearing from the other S.E. by E.½E. ¾ of a mile apart, with the letter V, and numbered 1, 2, 3, 4, the last (No. 4) carrying a

Order of Buoys in New Channel.

perch; and by *three* black nun-buoys on the larboard or northern hand, bearing also the letter V, and numbered 1, 2, 3, but trending in an elbow figure, inasmuch that 1 and 2 lie S.E. by E.¼E. and Nos. 2 and 3 E.S.E. of each other, though separately at ¾ of a mile apart, and nearly abreast of 1, 2, 3, red buoys of the starboard side. The first-quarter flood and last-quarter ebb set directly up and down the New Channel, in line with the Bell Beacon and V 3, red buoy; before and after those periods of tide, the stream sets S.S.E. and N.N.W. Therefore, if you are taking this channel in thick weather at half-*flood*, first pick up the larboard (northern) buoys, E. by S.¼S. ¾ of a mile will fetch V 1, *black*, from the Bell Beacon. If, however, you are laying in about half-*ebb*, follow up by the starboard (southern) buoys, S.E.½E. ¾ of a mile will pick up V 1, *red*, from the Bell Beacon. You will thus counteract the tidal inclination, and be, as it were, on the weather side of the passage, according to tide; otherwise shape your course thus,

Set of Tide in New Channel.

How to act according to Flood or Ebb.

INTO THE NEW CHANNEL

BY NEW CUT OF 1839,

(LATTERLY DESIGNATED

VICTORIA,)

BY DAY, WEATHER CLEAR OR FOGGY.

Taking New Cut into New Channel.

SHAPE your course from the Bell Beacon S.E. by E.¼E.; if clear, the Light-vessel (red hull, with black ball at mast head) will be right a-head, and in one with the (flat shaft-looking) lighthouse, and an intermediate black-framed beacon, on Crosby Shore. In ¾ of a mile run, you ought to be right between two buoys, V 1 black, (larboard,) V 1 red, (starboard,) and at the steep edge of the 11-feet bar. In less than a ¼ of a mile the water will deepen *two* feet inwards; and when advanced to between the V 2 black and V 2 red, the water will have deepened *four* feet, and you are in the body of the *original New Channel;* from this the water deepens *four fathoms* more when between V 3 black and V 3 red; but it decreases *ten* feet up to the Light-vessel, which lies in 5 fathoms at low-water, at ¾ of a mile farther on from or abreast of No. 3 buoys.*

Taking original Entrance into New Channel.

* HOW AND WHEN TO AVAIL OF THE ORIGINAL ENTRANCE INTO THE NEW CHANNEL.—Should you be reaching towards the New Channel, with the wind at N.N.E. *after* half-flood, or *before* half-ebb, and happen to be southward of the fairway line into the new entrance, it will save you all the delay of working a traverse to windward—your standing right on through the former entrance into the New Channel, and thence across its south-eastern-elbow, in 14 feet at half-tide, or 19 feet at four-hours' flood. By bringing the Formby Light-vessel in one with the S.E. Mark (the recent Lighthouse), bearing E.¼S. a *day* leading-mark familiar for the last five years, you will be on the shallowest part of the bar, when a *red* and *white* chequered buoy (N.Fy.) appears close on your starboard,

On approaching the Light-vessel don't attempt passing *south-westward* of her; for, though deep water, the passage between her and V 4 red with perch, is but narrow, little better than a cable. Your business is to haul *north-eastward*, as short round as possible, bringing the Light-vessel astern on the bearing of N.N.W.¾W. You thus give a berth to 'Taylor's Bank,' guarded by C 1 black buoy, lying ½ of a mile due east of the vessel; and are now in the Crosby Channel; Approaching Formby Light-vessel.

UP CROSBY CHANNEL,

BY DAY, WEATHER CLEAR OR FOGGY.

If it be *flood*-tide steer from Formby Light-vessel S.E.byS. to give the steep elbow of Burbo (guarded by C 2 red) a good berth. In this channel you have *six* black nun-buoys on the larboard or eastern hand, at rather more than a mile apart, bearing nearly S.E. by S. from 1 to 3, and trending S. byE. from 3 to 6, guarding the off-lay of Crosby-main; and *three* red can-buoys on the starboard or western hand. C 1 red denotes the south extreme of the West Middle, or, as I now consider it, the north-east elbow of Burbo; C 2 red lies upon the edge of Burbo, two miles above the light-vessel; and C 3 red, *with perch*, guards the very eastern elbow of Great Burbo—all upon your *starboard* hand. There is no other buoy on this hand until you come within Hauling up Crosby Channel from Formby Light-vessel.

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or southern hand, in 25 feet at half-tide. If, however, you should make this buoy in thick weather about low-water, 10 feet will be carried into the body of the New Channel, from a cable-berth *northward* of the N. Fy. buoy, upon an E. by N. course, passing V 3 red the like distance to the northward, and thence S.E. by E.¼E. to the Light-vessel.

a quarter of a mile of the Rock Lighthouse, the bank being so high (21 feet above low-water level) as to generally *show* itself;* but in the event of its absence, an excellent *leading*-mark (or, if beating, a quick turning-mark) is afforded, as appears in view C, viz. the old Gothic-towered Church, (St. Nicholas, by the docks,)† in one with the Rock Lighthouse, (bearing S. by E.) clears the whole of Burbo, and passes the elbow buoy, C 3, a cable's length to the eastward. Vessels coming down upon the ebb with light winds, should be mindful of a great tendency of ebb to set *upon* Burbo, when at all towards it, by reason of the several swatches; the strongest set is at the large perch-buoy, C 3. It may be useful to weather-stressed craft, or even a crippled ship, to be apprised of an advantage (if *beaching is inevitable*) to be gained by selecting that portion of beach directly off the south extremity of the first terrace of houses situated on Crosby Shore, called Waterloo, and where a black buoy (C 5) is moored. If you are *southward* of that buoy, you can be forced up on pretty soft ground close to high-water mark, and may haul northward, if at all manageable, under the lee of a high ridge, which is rapidly growing, and is now above neap-tide

Clearing-mark for East margin and elbow of Burbo.

Beware of *cross*-tide-draught on Burbo, when coming down Crosby Channel on *ebb*.

May *beach* with safety to life and cargo off Waterloo.

*I have never recommended more Buoys between C 3 red and Rock-Gut Buoy, because I hoped from time to time to see a bulky *refuge* Beacon erected on the edge of the high shoulder of Burbo. If such is not conceded soon, a Floating-Beacon, or 2 more Buoys, are imperatively called for, though the facility of *screw*-piling cannot leave a doubt as to the double-purpose *refuge* Beacon, notwithstanding the contemplated subsidiary *Light-vessel* off Crosby Lighthouse.

†It would also be a most desirable *night* leading-mark, if the illuminated Clock of this Church was strengthened by a reflector and *red*-tinted glass, on the face which shows towards the Rock Light: I have often wished it.

level, that stretches laterally with the shore a ¼ of a mile off high-water mark; but if you drive on *northward* of the buoy C 5, you must be engulphed in *detached* breakers beyond all succour. In bringing you up to the Mersey through the New Channel and Crosby Reach, by day, I may leave you abreast of the Rock, to act upon previously-given *night* instructions;* or, at once taking up your anchorage one-third towards the western shore of river, any where *northward* of the north end of docks, so as to be ready for docking when the pilot proposes, (a process which requires local habit and routine,) I need only add that, as the converse of rule for *coming in* acts and applies to *going out,* no distinct directions need be given, especially as in that case you cannot, or *need* not, be without local knowledge, or a pilot.

If *Outward* bound.

There are two other passages ('Old Formby' and 'Half-tide Swatchway') into the lower reach of Crosby Channel, besides the New Channel; the first in order of the two, and indeed the most straight-forward passage of any into Liverpool, after half-flood, and before half-ebb, is the

HALF-TIDE SWATCHWAY, OR *ZEBRA CHANNEL.*

This Swatchway consists of a break in that mass of sand which here and there dries up in knowls of 2 feet high; larger portions come *a-wash,* and the whole, forming an under-flat of 6 feet, with certain dykes and holes, continuously with Formby Bank, along Old Formby Channel to abreast of Mad

Its region and feature.

* *Vide* page 40.

Wharf, and thence south-westward to the bar of New Channel, occupying 9 square miles, and known of old as *The Jordan Flats*, falling *inward* as well as *outward*, abruptly, into 4 and 5 fathoms water, the *outer* bottom being chiefly *mud*.

When first delineated and beaconed for navigation.

I had the satisfaction of being the first to delineate and buoy this passage; and when deciding the site of the Formby Light-vessel in 1833, for the primary purposes of the New Channel, I was careful to adjust her east and west position, with reference to her acting as a night or day leading-mark through the Swatchway when in line with the Rock Light-house; it was deemed an achievement (and to this date presents its first facility) of providing a 12-feet channel for eight hours in every twelve, where an *unbroken mass of sand* was portrayed on charts, *and avoided accordingly*. I had the satisfaction of witnessing, for five years, almost all the northern traders pass through it, and occasionally the largest ships. Captain Delano, of the *Roscoe*, New York packet-ship, was the first to avail of it upon an easterly wind, and was so rejoiced at saving tide and docking-time, that he took pains to promulgate it. He entered quite into my view of its facility, when a ship is working into Liverpool Bay under an *east* wind; few would attempt to turn up either of the other channels, so that if a steamer does not offer, he may anchor for days outside; but if he reaches to the N.N.E.* satisfies himself it is *half-*

Important to Ships arriving under *East winds*.

Need not lose a tide by anchoring or waiting a steamer, but *can* proceed.

* Or steers from N.W. Light-ship to the Bell Beacon, *passes the Beacon*, and keeps on N.E.¼E. with *Bell Beacon and Light-ship in one*, he will clear the outer edge of Jordan Flats, and pick up the H^{r} Fy. Buoy on the starboard bow, in 2 miles' run.

flood, tacks, and brings the Rock Light and Formby Vessel in one, S. by E.½E. (view B) he carries 18 feet right through *up to the Light-vessel*, and, upon the same board and flood tide, up Crosby Channel to *the dock gates*. It saves time, expense, and averts all chance consequences of remaining outside at night; facts, that require *no advocacy* to the commander of a ship. The true set of tide through also recommends it for hazy weather, when the Rock Lighthouse may be obscured; to provide for which, it is guarded by *three* buoys, bearing the channel character, HF, the outer one having (Fy.) (fairway) in addition; this buoy, and the *eastern* buoy, are painted white, with a *vertical* black stripe; the western buoy white, with horizontal stripe, (hence pilots facetiously call it the 'Zebra Channel'). The *outer* buoy is the *Fairway Buoy*, and bears from N.W. Light-ship, N.E. by E. 6¼ miles; from Bell Beacon, N.E. by E.½E. 2 miles; from Formby Light-vessel, N. by W.½W. 2½ miles, nearly; and bringing Formby S.E. Mark to bear S.E. by E.¼E. will lead to it. This buoy guards the outer *cross*-spit of Jordan, in 8 feet water, but lies directly on line with Rock Lighthouse and Formby *Floating*-light; you should pass it on the *western* side, and in a mile run, upon S. by E.½E. course, you will fall in with a white *black*-striped buoy, upon each hand, ¼ of a mile apart, (with 4 feet only at low-water springs): pass *between* these buoys, and the Light-vessel will appear through the haze, immediately as she is only 1 mile from you. Once at Formby Light-vessel you are in the Crosby Channel,

Affords 18 feet at half-tide.

Tide sets *true* through it.

Its Buoys.

Proceeding towards Formby Light-vessel.

At Formby Light-vessel.

and will proceed as already explained.* Returning to the Northern offing, the *third*, but tortuous and seldom-used, passage (except by coasters,) to be considered, is

THE OLD FORMBY CHANNEL.

This is the original northern approach to the Mersey, but now only resorted to by coasters from northward and eastward. It is a funnel-like passage or gut, bounded on the eastern hand by the main sand of Formby Point, called '*Mad Wharf*,' which dries out from the low sand-hills 2 miles N.W. by N. trending sharply southward, and then eastward, with a nine-feet spit, called 'Formby Spit,' reaching 1½ mile further north-westward, altogether 3½ miles off shore. From this spit, the edge of shoal water trends eastward towards the Ribble, whilst the outer edge of Jordan Flats trends S.W. for 4 miles in direction for N.W. Light-ship; the whole reach of Formby Spit is guarded by a large black buoy, marked F.*N.W.* and known as the 'North-west Buoy', from which a course of S.W. for N.W Light-ship, 8 miles; or for Bell Beacon, S.W. 3¾ miles, in not less than 3 fathoms, at low water. The *western* side of this 'Old Formby Channel' is formed by Jordan banks, very steep-to, and guarded by three *red* can-buoys, marked 1, 2, 3, with the letter F upon each; the last red buoy, No. 3, has a perch, indicating the elbow of the *triangle* passage; and directly opposite No. 2, red, a black nun-buoy, F 1, called Formby Point Buoy, guards the steep part of Mad Wharf. The

Eastern side of Formby Channel.

Formby Spit.

Western side of Formby Channel.

Characters and position of Buoys in approach.

* *Vide* page 69.

Channel here, and throughout, from F.*N.W.* Buoy, is ¼ of a mile wide, and the extent of its buoyage, 3½ miles. A chequered black and white buoy, marked F. Fy. lies in the fairway entrance, ¾ of a mile S.E. of the N.W. Buoy, known as the 'Fairway Buoy'; there is never less than 16 feet at this buoy, coming from 4 and 3 fathoms, and immediately dropping into 3, 4, and 5 fathoms, (muddy bottom,) as you pass in from the Chequered Buoy. In hazy weather, you need only pass these five buoys at half-a-cable distance, on your starboard or *western* hand, leaving F 1, black, on your larboard, and you will be in a pool of smooth water, until half-flood, with stiff holding ground, abreast of F 3, red, with perch, from whence the flats between it and Light-vessel carry only 5 feet at low water, but quarter-flood will give you 13 across, guiding yourself by the buoys, which, on hauling S.W. by W.¼W. towards Light-vessel, presents a *black* buoy, upon Formby Bank (F 2, black), directly south of the red perch buoy, two cables distant; leave it on your *larboard* hand; then a *red* can-buoy, F 4, red, guarding south spit of Jordan Bank, leave *it* upon your *starboard* hand; then a black nun-buoy (F 3), denoting Formby Flats; leaving *it* on your larboard hand, proceed to within hail of Formby Light-vessel, and haul up Crosby Channel, for Liverpool, S.S.E.¼E. looking out for black buoys on the larboard hand, and red on the starboard. A good leading mark is afforded for running into, and half-way up, the Old Formby Channel, should the buoys be adrift or obscured in

Soundings in approach.

Hauling across to Formby Light-vessel.

Leading-marks when the Buoys are adrift.

the breakers, by bringing Formby S.E. Mark in one with a conspicuous frame-work beacon, [see drawing in Appendix,] called the '*N.W. Mark*,' situate close to high-water mark, upon sand-hills, 1½ mile N.W. of the S.E. tower mark; when in line, they will bear S.E.½S. and appear as in view O. Run thus until abreast of F 2, red, or F 1, black buoys; or, when Everton Church, over Liverpool, is closing with Crosby Point, (S. by E.) or with the frame-work beacon on Crosby shore, in line with Bootle Water Work's high chimney stack, bearing S. by E.¼E. upon either of which lines you may run till abreast of the perched red buoy F 3, of triangle. This channel may thus be availed of as an anchorage, by ships drifted during a hard gale at west to the eastward of the other channels, and so escape the mischief of Ribble banks; indeed, small vessels can find two fathoms and riding-room 1½ mile up this Formby Pool, southward of the turning *triangle* buoys, even until the S.E. Mark and Formby Beach Mark come in line (E.¾S.) I have rode out many a 24-hours' breeze in this pool, merely knocking about, (but never driving,) during high-water time; when, if bound up, you can shape a course over all, in 12 feet, at 5 hours' flood, *neap tides* even. Those acquainted, may manage this channel in 22 feet over Formby Spit, at half-flood by night; thus, first bring Crosby Light (red) S. by E.¾E. watch when it masks, as it *ought* on that bearing, then haul for it and keep it a-head, S. by E.½E.* and when the Formby Vessel bears

When the upper part of this Channel (Formby Pool) may be desirable as an anchorage.

How to approach it *over-all* at half-flood by night.

*This line will skirt close along the edge of Mad Wharf; it is too steep

W.S.W. haul *for her*, bringing her upon the larboard bow, to allow for *flood* hustling you to the southward. To such as may be in distress and are craving assistance, ere nightfall, in this region, it will be a comfort to know that a life-boat station is established close to the N.W. Mark, at Formby Point, where, or at the S.E. Mark, or Crosby Lighthouse, a blue flag will be hoisted, in recognition of your case; and, if a telegraph, at Crosby, which I have repeatedly urged, be established, three hours will be saved in communicating your difficulties to the town.

Formby Life-boat House.

Criterion of being observed.

The masking limits of the new *Crosby* Light is intended to fulfil those I arranged at the recent Formby Light; and it does it in a more defined way *northward*, in consequence of being on a western advance of land, compared with Formby, and, therefore, affording a more lateral trend with the low-water margin of 'Mad Wharf.' You are, therefore, decidedly westward of the whole line of Mad Wharf Sands *when* you see Crosby *Light*, and when brought to bear S. by E.¼E. (its *intended* eastern limit of light,) you shave the western low-water margin, *after* crossing Formby Spit, in 7 feet at low water. Moreover, your *losing sight* of Crosby Light, on a clear night, when at a five-mile offing, northward, warns you of having got eastward into the indraught of the Ribble estuary, the wicked shallows of which it is your *first* business to *shun*. But should you be by chance eastward of 'Mad

How the masking limits of Crosby Light operate in this quarter.

for *lead*-warning *after* over the spit; *then* you must keep in 6 fathoms (half tide.)

Wharf,' upon a scant N.W. wind, you may be sure of 15 feet water, at half-tide, *over* it, with Hoylake Lights in line with Formby Vessel, when she will bear S.W. by S. upon which course and depth you may go *right up to her* over the Jordan Banks. You have another hint in this direction, when standing across or rounding Mad Wharf and Formby Spit, by day, viz. you are in good distance so long as the S.E. Mark, at Formby, is not dipped behind the sand-hills which form the fore-ground.

When you may make free, and how to judge your distance.

The mariner will have observed—and I readily anticipate and receive his reproach for—that I led him forward through the Horse and Rock Channels, *by the lights*, without referring to their features or buoyage. The fact is, I purposely abstained from charging his mind for *night* navigation with what he could not proportionally benefit by; my method, founded on long experience, and vivid recurrence to my own exigency, when taking up the accredited sailing directions of others, confiding my ship and crew to a calm and careful observance of the author's rule and general hints, when (always presuming one to be a *stranger* and without a pilot) the *chart* and relative position and action of the lights, explained by book, is enough for *night* work; but for manœuvring to the best advantage by *day*, one cannot be apprised in detail of too much respecting each channel. Our first acquaintance with the Horse and Rock Channels was by night; the other channels into Liverpool have been treated of by day as well as night; my next business is to offer you a

My motives for adopted *mode* of compiling these Directions explained.

DESCRIPTION OF

THE FEATURES AND BUOYAGE

OF THE

HORSE AND ROCK CHANNELS.

These channels unite in *continuous* order, forming a *bending* course of stream, southward and then eastward, from the N.W. Light-ship to the Rock Lighthouse. The *Horse* Channel is the seaward portion, bounded on the south-western hand by East Hoyle Spit and high sand-bank, which ranges 4½ miles right out north-westward from Dove Point; and, on the north-eastern hand, by the Six-feet Flats, which outlie the North Spit 1½ mile N.W. by W. The Rock Channel is formed by the main strand on the *southern* hand, which outlays the high-water mark in a flattened shelf of sand, that dries out from Dove Point 1 mile (called Dove Spit), from Leasowe Castle ¾ of a mile (called West Wharf), and from Wallasey Sand-hills ½ a mile (called East Wharf); the whole beach called Mock-beggar Wharf; and, on the *northern* hand, by the continuous margin of North Spit, North Bank, and Brazil Bank, a trend of steep sands that extend, laterally with the main, 5 miles westward of the Rock Lighthouse, and may be considered as presenting the southern side of that great triangle of sands, known and dreaded as the 'Great Burbo Banks.' The *Horse* Channel *terminates* in limit and water at the North Spit, *beginning* at 1 mile *within* (S.E.½S.) the Light-ship. It carries 9, 7, and 5 fathoms at low water, until a ¼ of a mile eastward of North and Dove

Relative connexion.

Dove Spit.

North and Brazil Banks.

Extent of Horse Channel.

Spits, or when the Hoylake Lights come in one,
Set of Tides. (S.W.¼S.) view L. The *first* half-flood and *last* half-ebb sets fairly up and down this channel, but after half-flood and before half-ebb it sets obliquely over North Spit for Rock Lighthouse. The whole length of this channel is 3½ miles, and at its narrowest part (abreast of a nine-feet patch) is ⅓ of a mile wide. The N.W. Spit and south-western margin of the channel is guarded by 4 *red* buoys, numbered inward, and bearing the initial of the
The Flats and Buoy. channel, H. The north-eastern side is only intruded upon by the nine-feet patch, and there guarded by a *black and white nun-buoy*, (marked H 1,) known as the Buoy of the Flats, inasmuch that the patch lies upon an eleven-feet spit, which springs ⅓ of a mile westward of the Six-feet Flats.
Character and Number of Buoys in Rock Channel. The *Rock Channel* is guarded on the southern hand by *four red* buoys, numbered from outer approach, and bearing its initial, R; and on its northern margin by *seven black* buoys, alike numbered in succession, and marked R. This channel is 4¾ miles, trending E. by S. contracting so as to be a blind channel at low water, by uniting with the main beach (at ¼ of a mile below the Rock Lighthouse) awash at low-water great springs, forming a bar of ½ a mile, in and out, with 2 feet here and
Rock Gut. there, and called the *Rock Gut*. To *appearance* the Rock Channel widens at the lower, or western end, on account of the black and red buoys being twice the distance apart; but it is sadly interrupted and in a choking state in that space, by reason of a
Beggar's Patch. bank, called 'Beggar's Patch,' of ⅛ of a mile wide,

and stretching 1¼ mile *obliquely*, in line from West Wharf to the North Spit, having as little as 5 feet upon its western part, and admitting but 10 feet between that part and North Spit, in a passage of only ⅛ of a mile wide; whilst the passage between its eastern part and beach, abreast of Leasowe Lighthouse, is nearly as shallow and narrow. Both ends of this patch present a quartered *black and white* buoy, marked B 1 and B 2, and it is above this buoy that the tide-stopping anchorages of 'Leasowe Hole' and 'Wallasey Hole' still retain 3 and 4 fathoms water. Time was when the largest ships of Liverpool could retreat to, or proceed from, these good holding-grounds, and tolerably-sheltered roadsteads, at low-water springs; but at this date it is *barred* up from ¾ ebb to ¼ flood for ships requiring 18 feet; a sad declension in the approaches to Liverpool, as the next anchorage, which a sudden backing of wind upon a young flood imposes on a ship, is terribly exposed to northerly winds, viz. the N.E. Buoy anchorage, *i. e.* between Dove and North Spits. The approach to this occasional anchorage, up the Horse Channel, is rendered of late a tortuous and baffling channel under a strong, or very light, south-west wind, in consequence of the north-east elbow of East Hoyle Bank having advanced to the N.E. and the North Spit Flats to the S.W. since the line of sea lights were established to *lead up in one*. The necessity, therefore, of opening them one way, then crossing them and opening the other, is obvious, but *when* to do so at night was most vague and hazardous, until I had the sa-

Leasowe and Wallasey Holes.

No longer places of Refuge-Anchorage, or for Departure against young flood under fair wind or steam power.

Necessity of *traversing* the Sea Lights.

tisfaction of masking the two Hoylake Lights upon defined lines, in 1836.—[*See Notice to Mariners, in Appendix.*] By this application of the breast-lights, the forward steering-lights, Leasowe and Bidston, (both fixed bright lights, situated 2 miles apart, on the bearing of S.E.¼S. Bidston elevated 244 feet, and Leasowe 110, above half-tide mark, [*see special description, page* 10,] are subservient to easy night navigation with a *leading* wind; pilots, indeed, manage to *beat* up to North Spit under a S.S.E. wind, which affords a *lay-up* the Rock Channel. Even at *night*, therefore, you have only to consider the lift of tide according to draft and tide-gauge table, *half-tide* always giving you 16 feet through the Rock Gut; the lower light at Rock at night indicating 12 feet lift, as a black ball does by day.

TO PROCEED

INTO THE MERSEY

(BY DAY)

THROUGH THE HORSE AND ROCK CHANNELS.

I suppose you *at the Light-ship*—the land objects clear, but some of the buoys adrift, or obscured in spoon-drift, (flying spray,)—you must, in fact, look to *leading*-mark objects—it is, of course, proper advance of tide. You bring your head S.E.½S. when Bidstone Lighthouse shall appear its apparent breadth, open *eastward* of Leasowe [view D]; on this line you enter and proceed up *Horse Channel*, and *ought* to see H 1, 2, 3, red buoys, a cable's length, on starboard hand, with a chequered white and black buoy right a-head; look out when Upper Hoylake Lighthouse bears *south*, or when you are midway between the red buoy H 3, and black and white buoy of the flats, or when you shoal your water a fathom; whereupon, haul across *southward*, to avoid the said *flats*, and *open* the lighthouses, Bidston and Leasowe, twice as much to the westward; then haul for Bidston again, passing another red buoy, H 4, on starboard hand, ¼ of a mile off, and H 1, black and white, of flats, a cable on *larboard* hand; now look out towards the Rock Lighthouse, and a tall Water-work's chimney, generally smoking, will appear on the flat land, north of Liverpool, known as *Bootle Stack*, and directly it and the Rock Lighthouse *come in one*, bearing

Fairway course and position of Sea Lighthouses open *Eastward.*

Upper Hoylake bears *South*—alter course, and *open* Sea Lighthouses *Westward.*

Mark for *rounding* Spencer's Spit.

E. by S.½S. [view F,] haul upon that course, passing close southward of a large black can-buoy, with a perch, R 1, called 'Spencer's Buoy,' and showing the extreme of North Spit; proceed, passing the Beggar's Patch Buoys, black and white, on starboard hand, and R 2 and 3, black buoys, on the larboard; observe when Bidston Mill opens eastward of Leasowe Castle, (S. by E.) (the former is situated ½ of a mile southward of the lighthouse, and the latter, a castle-cluster of buildings, at high-water mark,) or when Leasowe Lighthouse bears S.W. or better, when abreast of R 3, *red* buoy, on starboard hand; *then*, haul due *east*, passing R 4 and 5, *black* buoys, on the larboard hand, until Bidston Mill opens eastward of the lighthouse, (S.S.W.) or when you are two cables past R 4, *red* buoy, your water shoaling a fathom; when you must steer E.S.E. passing R 6 and R 7, black buoys, on your larboard hand. The leading-mark for this reach, and for carrying the best water through Rock Gut, being the frame-work beacon on Walton-hill, (situated half way between the 'Bootle Stack' and Walton Church,) called *Inner* Bootle Mark, brought ⅓ nearest the *northern* of the two white, cut black, obelisks, (E.S.E.) situated on the beach at Bootle, on the Liverpool shore, [view G]. Pursuing this line you may haul southward into the Mersey, as soon as you deepen your water 5 fathoms, or have passed the buoy on 'Rip Raps,' (red, R 5,) upon your starboard hand; or, when Rock Lighthouse comes on Red-Nose Cliff, bearing W. by S.½S.

Course up first reach Rock Channel.

When to haul up second reach.

Mark for best water over Rock Gut Bar.

Act according to circumstances when rounding Rock Lighthouse.

Your taking up *anchorage*, preparing for docking, or *backing* and *filling*, until tide time, must depend on circumstances. If too stormy for a pilot to come off, even in the river, (which I have known to happen,) anchor one-third towards the Cheshire (western) shore, *as soon as you can*, after rounding the Rock Lighthouse. If not intending to dock, proceed to the Sloyne anchorage, or, if proper, the quarantine ground, already described in page 42.

THE HORSE AND ROCK CHANNELS,

UNDER HAZY WEATHER OR SCANTY WIND.

If *turning* up the Horse Channel in hazy weather, the *lead* will warn you of tacking time, by shoaling gradually, when standing *eastward*; but the lead gives no warning when standing *westward*, the margin of East Hoyle being so very steep. In like manner in the Rock Channel, you may *feel* your way with the lead along the *main* shore, but will receive no timely check when standing northward, towards the abrupt edge of North Banks. You should be reminded of 12 feet water being ensured over the Rock Gut Bar, whilst a *steady* bright light is exhibited at the Rock Lighthouse, from the *lower chamber*, or a black ball, shown by day, above the balcony. You should, at the same time, be cautioned against hugging the main too close, lest you trail upon the strip of shingle that stretches *from* the lighthouse, parallel to the channel, upon the shore, a little within low-water mark, trending altogether, W. by N. for one mile; and in *rounding* the Rock Lighthouse, beware of the rocky ledge that extends from the lighthouse base, *one cable off, north-eastward;* also, of the steep sand elbow, called '*Rip Raps,*' guarded by a red buoy, (R 5,) outlying lighthouse and fort, *two* cables eastward.

Lead gives no warning.

Indications of 12 feet water in Rock Gut.

Feel your way along the main by *Lead*, but don't hug it too close.

Rock Light-house Ledge.

Rip Raps.

You will have observed, on coming through the Rock Gut, the vast expanse of working channel which the north and south course of the Mersey

presents, compared with the funnel-like channel you have come from, and so abruptly connected at right angles as the Rock Channel is; and true it is, that when you look *south* from the Rock Light-house, steep shores, densely populated, on the east, (Liverpool,) and thickly studded villas, hotels, &c. on the western margin, present the confines of a vast column of tidal water, in no part, for 6 miles, less than ½ a mile wide, nor less than 30 feet (off Birkenhead as much as 60 feet) water at *low-water springs*, with a velocity of stream as much as 7 miles per hour on the ebb; discharging 779 million cubical yards of water at a tide; producing in its continuous and natural course northward, the broad channel of 'Crosby' reach, 5 miles by 1 broad, and 40 feet deep at *low-water period.* The question naturally is, why bring me through any other than *Crosby* Channel, seeing *that* is a *leading* channel under all winds, except south, and then I could *turn* a line-of-battle ship up it? Alas! it is the penalty of rivers joining the sea at the *bight* of a bay, that their impetus of disgorge must exhaust itself before reaching the *cross*-stream of open sea, whereby vastly-spreading and indefinite deposit takes place, forming, as it were, a threshold-bank of shallows, denominated bars, just where free access is most to be coveted, because remote from leading objects, much exposed to ocean swell and instant breakers, and more difficult to control or coax. But as such position signifies the very *clue* to a port, so should it incite the ceaseless attention of the marine surveyor, and the cordial dedication of

local means on the part of the port's guardians, to disperse, by occasionally *vigorous* (and constantly moderate) dredging and harrowing process; accumulations that—whether by splitting the column of ebb, or presenting a barrier to it—may obstruct *early*-tide intercourse of shipping. Such has the port of Liverpool to consider at this date; for, at the lower end of that mighty column of water which rolls past the extensive docks and Crosby line of coast, *when it arrives off Formby*, super-charged, as it most reprehensibly is (and heedless of my frequent remonstrances) with 75,000 cubical yards of dock mud and silt, *cast annually into the river abreast of the docks*, a cruel addition to its natural turbidness. In a word, the Great Crosby column so deposits its silt 7 miles below the Rock Lighthouse, its exhausted point, as to be split into *three* escapes, each of which become, in course of tidal rise, tributary, but (for the wonted purposes of the second emporium of Great Britain) *inadequate* avenues from sea.

HELBRE SWATCH.

In 1834 I had occasion to resist, by detail argument, the proposition of removing the N.W. Light-ship two miles *farther to the northward*, whereby to adapt her chiefly to that remote and ever-varying New Channel region. The depriving the Horse Channel of its long-accustomed beacon would, of itself, one would have thought, have negatived such a proposition as soon as conceived. But I added to the inducements of preserving her present station, (until, upon the spit of East Hoyle, a screw-pile lighthouse supersedes her and her casualties altogether,) the essential finger-post, or point of departure, she presented for that straight-forward passage into an occasional refuge, *Helbre Swatch*, of the value of which none know better than the Liverpool pilot-boat masters. It has the advantage of being straight up from the Light-ship in Liverpool Bay; is buoyed on either side, and led by two conspicuous beacon-frames on Helbre shore. Its entrance, however, is crossed by a *ten-foot bar;* but as neither Hoylake, to which it leads, nor Lime-wharf Flats, leading to Dalpool, can admit 12 feet draft until two-hours flood, so is the *bar* no impediment to inner intercourse; excepting the case of a heavy Liverpool ship in a *crippled* state, in vicinity of Light-ship, desiring access to the upper part of the Swatch, under a severe north-easter, a wind that would preclude her laying through any of the *present* channels into Liverpool, but which is sheltered

An inconsiderate proposition averted, respecting changing site of Light-ship.

Its *Bar*.

When desirable and available.

until four-hours flood, any where between Helbre Island and West Hoyle: with such a view, if requiring 17 or 18 feet water, you must be sure it is not earlier than first-quarter flood, nor later than three-quarter ebb. Helbre Swatch *Bar* is a curved sandy shelf, a ¼ of a mile from edge to edge, and connects the two nine-feet spits of East and West Hoyle together, upon an east and west trend of ½ a mile spread; its centre-line intersection of outer edge is ¾ of a mile, S.½E. of the Light-ship, rising abruptly from 43 feet, sand and mud, to 11, sand and shells, falling to 19 feet at ⅛ of a mile within, 30 feet at ¼ of a mile, 9 fathoms at 2 miles up, 10 fathoms at 3 miles, and 8 fathoms at 4 miles up; the Swash extends 4 miles, upon the bearing of S.½E. washing the base of north extreme of Helbre Island, bending thence S.S.W. for 1 mile more, in 7 fathoms, with no part of the 5 miles less than ⅛ of a mile wide; its margins are steep-to, and the general water too deep to obtain soundings with working way; flood and ebb sets true, but as the lead will not guide you, except from four-hours flood to two-hours ebb, (when the margins are well covered, and yield a slope for borrowing); and as you have no guiding object at night but the *back* bearing of the Light-ship, so I would not recommend its inducements except for *day-light*, when, in clear weather, you have *frame beacons*, with diamond-figured tops, 70 feet high, situated upon a S.½E. line, a ¼ of a mile eastward of Helbre Island, the inner *upper* and *southern* one standing on the rocky islet called 'Eye,' and the outer and

Relative Soundings about the Bar.

Lead only a guidance at certain stages of Tide.

Not available *at Night*, except clear moon-light.

lower one upon the *main* beach abreast of Helbre Island. These marks produce the quickest action, even upon the bar; therefore, on leaving the Light-ship, you have only to bring them *in one* [view J], bearing S.½E. and run upon their line, passing *two black* buoys on your *larboard*, and *two red* upon your *starboard* hand, merely hauling for Helbre Island ⅛ of a mile short of the black buoy, with perch, which marks the turning into Hoylake; or when Bidston Mill (dark) comes in line with *Lower* Hoylake Lighthouse (white), bearing E.S.E. (southerly). Should you be too early upon tide, or mayhap on a *falling* tide, anchor upon the line of *Upper* Hoylake Lighthouse (white) and Bidston in one, (E. by S.¾S.) *close* over to West Hoyle high shoulder, which dries 17 feet up out of the water, when you will be on the leading line into Hoylake at half-flood, or in a fairway track for proceeding, at tide time, round to 'Mostyn Deep,' through 'Welchman's Gut,' (to be described,) or for Dalpool, upon a S.S.W. course for 2 miles, when you will perceive a *black nun-buoy* (marked 'Seldom-seen') placed upon the western elbow of Lime-wharf sands, and ⅛ of a mile (N.W. by W.) off a patch of flat rocks, called (from being at spring-tide low-water mark, and often sanded) 'Seldom-seen.' From this buoy, *left on larboard hand*, or, if absent, when Grange Mill and Kirby Church come in one, (bearing E.) you should haul S.E. for 1 mile, which will place you at the same anchorage in Dalpool, (to be described under DEE,) a ¼ of a mile N.N.W. of Salisbury *bar*-buoy, red.

Day Marks and Course.

When and where to anchor if too early for Hoylake or Dalpool.

'Seldom-seen' Rocks.

How to act in thick weather.

Should it be thick weather when you arrive off the N.W. Light-ship, and determine to proceed up Helbre Swash, you have a fairway course of S.¼E. a fair setting tide from the bar, and 6 buoys to guide you, viz. H 1, red, with perch, on the larboard side of bar, denoting the N.W. Spit of East Hoyle, which divides the Horse Channel into Liverpool from *the Swash;* and a red and white striped buoy on the starboard or western side of bar, bearing the initial character of the 6 buoys of this channel, HE 1. The first of these buoys bears S.E. by S.¼S. 1 mile from the Light-ship; and the second HE 1, S. by W.¼W. ¾ of a mile from her. It is desirable you make and near the latter, to avoid the flood indraught of Horse Channel, and in the first mile advance a *black* can-buoy, HE 1, will appear on the larboard hand, guarding the western margin of East Hoyle Bank; then, at 1¼ mile intervals, HE 2 and 3, *black can-buoys,* along the same margin in succession; whilst HE 2 and 3, red and white striped, lie south-westerly on the starboard hand, guarding the eastern edge of West Hoyle. The last of the red and white buoys denotes the eastern elbow, very steep-to, of West Hoyle; and the last of the black, HE 3, with perch, marks the S.W. *sharp elbow* of East Hoyle; whereat, the western entrance of HOYLAKE falls into Helbre Swash; which entrance is strongly marked on the southern hand by *Helbre Islands,* if such they may be called, for they dry up at their bases several feet above low-water level, upon a flat of sand that stretches a mile from the main; the

Entrance Buoys to Helbre Swatch.

Avoid tide-draught of Horse Channel.

Buoys in the Swatch.

Western entrance of Hoylake.

outer south-western part of which is called Lime-wharf. These islets consist of *three* at high water, but are united upon one strand at low water, presenting a ridge of sand-stone rock, trending 1¾ mile S.S.E. and N.N.W. The outer and northern islet is the greatest; it is a ¼ of a mile long by a sixteenth broad, presenting reddish sand-stone cliffs, of 40 feet height, flattened and verdant on its surface, with a telegraph at the outer quarter, and a white-faced dwelling-house on its eastern cliff: *Middle Helbre* is of same character, but of half the size, and separated by a rocky causeway of ⅛ of a mile. The inner islet is of mole-hill figure, of 30 yards diameter, situated ½ a mile S.S.E. of middle isle, and called 'The Eye,' upon which the southern beacon for Helbre Swatch was erected at my suggestion, in 1834. A drainage-stream gutters down, affording a muddy dyke for flats, close along the eastern side of Great Helbre, with 6 feet at two-hours flood. The low-water rocks range out a cable's length from the cliff at north end of Helbre, with 13 feet close to, where the tide *rises* upon equinoctial springs 32 feet, ordinary springs 29 feet, neaps 22, with a mean centre or half-tide level of 16 feet, and flows upon full and change of the moon 37 minutes past 10 o'clock. The passing stream makes 5 knotts upon springs, and 3 on neaps. The telegraph on Helbre is one of the Liverpool and Holyhead line, and is the intervening station between Bidston and Voel Nante. The island is situated in the port of *Chester*, but let on 21 years' lease, by the Dean and Chapter, to the

Lime-wharf.

Great Helbre.

Middle Helbre.

A mud Dyke for small Craft.

Rise of Tide, and High Water full and change)

Telegraph.

Island Proprietary.

Liverpool Dock Trust, who sub-let a part of it to the Trinity Board for storing duplicate buoys for the DEE, instead of their depôt being at Chester, as in 1836. Helbre Swatch is also within the port of Chester, but was buoyed and beaconed by the Liverpool Dock Trust, at my suggestion, in 1835. Helbre Island may be termed the *turning* or terminating feature of the eastern arm of the Dee estuary, but it is the *isolated* point; the actual main land angle is *Helbre Point;* a low sand-hill elbow, forming the north-western angle of the Cheshire promontory that divides the Dee from the Mersey. This point lies 1 mile E.S.E. from Helbre Island, with a ridge of sand-stone rocks running out a ¼ of a mile due north of it, called the *Red Stones,* which mark the western limits of the port of Liverpool. From this point the high-water coast-line trends in gentle curvation E.¼N. for 6½ miles, to Rock Lighthouse, the whole line presenting sand-hills and sea-walls, with marshes running 2 miles within, except at the last half-mile, where the north-eastern shoulder of Wallasey, now called 'New Brighton,' and its red and yellow sand-stone cliffs, present remarkable features, and serve to mark that north-eastern angle of Cheshire as Grange Hill and Mill do the north-western; though Grange does not rise nearer Helbre Point than 1¼ mile S.S.E. of it, but its relative altitude, with the half-tide mark, being 173 feet, commands useful attention for identity of Kirby Church, for instance, on its western slope, when working in the bay.

Helbre Point.

Red Stones, Western limit of the Port of Liverpool.

In the foregoing, frequent reference has been

made to Hoy-*lake* Church, Hoy-*lake* Hotel, and Hoy-*lake* LIGHTHOUSES. The natural inference to a stranger will be, that some haven or creek-anchorage exists; and so there does—*a shadow of what was*, but worthy of particular description and the attention of *others* besides the ever-necessitous and grateful mariner. It occupies the western limit of the port of Liverpool, and here forms the closing section of my commentary on its navigation.

Right abreast of, (and close to) then, of Hoylake Lighthouses, (described in page 12, and drawn in Appendix,) is situated

HOYLAKE!

A coaster's anchorage at all times of tide, and fishing-craft rendezvous, now; but once the road-stead of Britain's fleet, and where William III. embarked with his army for Ireland, in 1690, then called *Hyle*, or *High-lake*, being behind or in-shore of *Hyle*-sand, and where, in those days, the "great ships put out part of their lading, to lighten them for sailing over the flats into Liverpoole." Indeed, within the present century, the 'Princessa,' frigate, found mooring room there. It is more the business of these pages to touch upon things as they *are*, than as they *were*; but the evident declension in tidal capacity of Hoylake, between 1690 and 1839, claims retrospective view, if only to take warning from progressive results upon original channels, when *permitted* to diverge, or, in fact, not directed and guided to *preserve*, hitherto valuable courses of tidal stream. We look back only 150 years and perceive *Hyle-lake half-a-mile*

Its by-gone capacity and importance.

Its declension.

wide, with 15 feet water at its western and 30 feet at its eastern entrance; sheltered from N.E. to N.W. by one extensive sand bank, only covered at high-water springs, and known as *Hyle-sand.* At the present day, we behold it a mere dyke of 70 fathoms wide, having but 18 feet water retained at low water, in a small pool, a ¼ of a mile long, at its centre; with but 2 feet at its western entrance, instead of 15, and actually *dry* across its eastern, where there *were* 30 feet at low-water. Mark, however, the cause, and how more than proportionate to this silting up is the scouring away of sand and forcing of another channel, in the same interval. The eastern branch of the Dee, then navigable in 15 feet, at low water, right up to Parkgate, was so resisted in its reflux by Hyle sand, that it found escape through the lake, even at the rounding interruption which Helbre Island presented; but, when Lime Wharf extended itself out to the *Seldom-seen* Rocks, the deflected impetus struck incessantly upon Hyle Bank, and we now have a division of that bank, of 4 miles long, by ⅓ of a mile wide, carrying a column of water as deep as 60 feet, at low water, where the bank *did not cover at high-water neaps;* so that, in fact, the tidal scour has been 80 feet deep, and a positive removal of 147,739,975 cubic yards of sand by tidal action alone. Hyle-lake became gradually our present *Hoylake,* and from my five years' observation, the drift sand from the shoulder of Hoyle Bank, with north and westwardly winds, after the tide leaves it dry, will fill it up altogether, continuously with the main, in

Deflection of Eastern branch of Dee, and formation of Helbre Swatch.

comparatively few years. If, however, this loss of Hoylake was the only result to be deplored, it were well; but when we perceive that by this extraneous channel of 'Helbre Swatch,' the waters of Chester navigation, were, and are so divided and impoverished as to cause remarkable declension of its commerce, by reason of forked banks and bars depositing, whilst the eastern division of Hoyle Bank, known as 'East Hoyle,' has spread itself one whole mile to the *north-eastward*, thawting the original tidal course and channel into Liverpool, known as the *Horse Channel;* in fact, over-lapping the line of sea lights, (Bidston and Leasowe,) since they were erected upon a *clearing line.* A similar extension of Hoyle is manifested at its south-eastern elbow, which over-laps the line of Hoylake Light-houses, that *led into* Hoylake, when erected, and within the last 30 years. Now, I consider that, had the growth of Lime-wharf been arrested by timely harrowing or dredging, or the eastern branch of Dee brought through between Helbre and the main, Hoylake and Horse Channel would have been preserved to the mutual *benefit*, instead of *growing* disadvantage of Chester and Liverpool.* These circumstances may suggest a reply to the too-ready, but fallacious retort, "Oh! Nature will take care of us; *she* first formed the estuary, and established connexion with the ocean waters; she may change her course, but will preserve *some*

Present and growing mischief to the Liverpool as well as Dee Navigation.

I assume such might have been averted.

*Not only is the Helbre Swatch baneful to the navigation into Liverpool as respects the twisting of Horse Channel, but by disgorging so vast a bulk of the Dee-scour into that part of the bay where the first of each flood takes up suspended matter, and trails it over the Burbo and North Banks.

channel *somewhere;* and the ascertaining and portraying that 'somewhere' is your only business." Alas! such could paralyze the energies of a marine surveyor, if not self-nourished by ardent zeal; but *Nature* proves that *her* business is to provide for egress of *waters,* without reference to *ships; her* purposes are attainable by innumerable rivulets, if *bulky* escapes are resisted by obstinate sands: a *concentration* of water can alone serve the artificial objects of man—*his* 12 and 18-feet drafted ships are baffled and shut out by Nature's *rivulets.* It is, therefore, not only the marine surveyor's duty to trace the *voluntary* courses of a navigation, but to *anticipate* the season for *diverting, assisting,* and *guiding* them, mayhap *forcing;* but then *Nature* must *alone* present the difficulties: his suggestions must not be pronounced chimerical, whilst delay in adoption increases the evils discovered; nor his energies be cramped and discouraged by cold reasonings, or his labours rendered harrassing by fretting parsimony.*

Natural obstacles *sometimes* the very least the Marine Surveyor has to grapple with.

When the Marine Surveyor should resign.

REVERTING TO HOYLAKE AS IT IS.

An additional buoyage and beaconage was laid by me in 1835, when adding 18 buoys to the Liverpool navigation. Two hours' flood will give you 10 feet at the eastern entrance, and 14 at the western. It should be observed, that the *first half-flood* sets

Tidal capacity of entrances, and set within.

* Under such circumstances, the Marine Surveyor should not hesitate as to the alternative: a pause, beyond certain extent, in the exercise of moral courage, may jeopardise the vast concerns of a confiding *community* beyond redemption, and compromise his own judgment and reputation: *open demand* for operative means should take place of unavailing supplication. The *crisis* may require *his* retiring, but the *designed* work will be forced into realization at *any rate;* when honour and duty will be satisfied.

in at *both* ends of Hoylake, meeting in the centre, *i. e.* off the lighthouses; and after half-flood the chief set is *westward* until low water. No leading mark presents itself for leading right in, but buoys are placed at the elbows. The western entrance out of Helbre Swash is assisted (if buoys are adrift) by bringing Bidston Lighthouse in one with *Upper* Hoylake Lighthouse, (E. by S.¾S.) which leads obliquely over the bar; and you must edge northward when your water shoals. On this track you will have left 2 black buoys, HE 3, with perch, and L 4, *black*, upon your northern hand; a *red* buoy, L 3, will then appear ⅓ of a mile further eastward, which guards the main beach, as the others do the S.W. elbow of East Hoyle; you must pass the red buoy close to the northward, and steer for *lower* lighthouse, E. by S.¼S. until you deepen a fathom, or the large hotel is abreast of you, and closing with Kirby Church, S.¼W. when steer east, or for the craft or mooring-buoys, a ¼ of a mile, and choose your berth for best water with *either* of the lighthouses on with Grange Mill, dropping your anchor as close to Hoyle Bank as possible, which you will *see*, except at high-water springs. With that bank as a break-water, you have only to veer cable on the flood, and heave it in upon the ebb, and you will ride out *any* gale, retaining 3 fathoms water under you at low-water springs; but take care to have a kedge to the southward, in case of shift of wind to that quarter *trailing* you on the steep edge of Hoyle Bank upon the fall of tide. If indifferent about taking the ground, you will have soft flat layer upon the main, without any sea at

The *Western* entrance.

How the Buoys guide you.

Anchoring Marks.

Hints about Ground Tackle.

An occasional Night Mark for best water.

half-ebb. A guide is afforded at twilight, or moonlight nights, to the deepest water of the lake, by bringing Point of Air Light on with north extreme of Helbre Island, and will ensure your being clear of *Red Stones*. The actual lake may now be said to exist only from the hotel to the parsonage, *i. e.* two-thirds of a mile, the rest of the 3 miles being shallows each way. To come into the lake from the eastward, you will find 10 feet at *half-tide*, directly over *Dove Spit* from the Rock Channel, by bringing Helbre Telegraph W. by S. until up to *Jackson's Buoy*, marked L 1, *and red*, lying upon south-eastern angle of East Hoyle, leaving it on the starboard hand, and steering S.W. by W.$\frac{3}{4}$W. up to the next *red* buoy, L 2, $\frac{3}{4}$ of a mile advanced, when the Hoylake Lighthouses will come *in one;* after which, leaving *it* on your northern hand also, you will take up your anchorage as before.

Eastern entrance.

When crossing Dove Spit.

Eastern entrance when rounding Dove.

If you are after half-tide on the *ebb*, or before it on the *flood*, you must bring the two Dove Beacons in one, (bearing S. by E.) taking care that you are *northward* of *Hoylake* line of lights before bringing the Dove Marks in one, whether you be running in from the Horse Channel or Rock Channel; those beacons will lead you to Jackson's Buoy, from whence haul S.W. by W.$\frac{3}{4}$W. as before. On *leaving* Hoylake you will be guided by wind and the place bound, as to which direction you take *out*. The chief importance of Hoylake *now* is, affording shelter to pilot-boats —a life-boat station—to passing flats—and a short passage for steamers to Wales—and is of local importance to a fleet of trawlers. Vessels of burthen can only look to it according to exigency and last resource.

Present purposes of Hoylake.

THE

CHESTER FLATS, BAR,

AND

DEE NAVIGATION.

Locality, extent, and indication of the *Flats*.

It should be premised that the *flats* extend 5 miles westward of the *bar*. The bar means that ridge which, in an under-water shelf of 9 and 12 feet depth, unites the western extremity of the West Hoyle Bank (that stretches across the mouth of the Dee) with the western spit of Middle Patch; which patch is more or less connected with the main *flat* shore in 6 and 9 feet knowls and ridges of sand, mixed with fine gravel and shells. This inshore nest of shoals range off 3½ miles from Rhyl, (a town on the eastern point of the Voryd,) abreast of which the outer margin of these *Chester Flats* is marked, where the tail of *Middle Patch* unites, by a '*can-buoy*,' *chequered black and white, with perch*, (marked N.W.-Patch,) a very important buoy in thick weather, as guarding the rounding or crossing point of 8 feet danger, when approaching the Voryd entrance from the northward; but should it be adrift, you are cleared by bringing St. Asaph's Ca-

Cross-Mark for clearing Patch.

thedral and Rhyddlan Church in one, bearing south.

The Voryd inlet.

The Voryd (united with the Clywd) breaks into the sea through the marshes of Rhyddlan 7 miles westward of Point of Air, taking a tortuous course to low-water mark of a mile outlay; the gutter is denoted by four black *log-buoys* on the eastern hand, and two perches on the western; each changed in position, but in same order, as the course fluctuates.

Its entrance and Quay.

It is immediately round the western point of entrance that a small quay is erected, affording shelter and good layer, with 13 feet at high-water springs,

Its purposes of resort.

and 9 at neaps. Small craft get in at 4 hours' flood, and track up to Rhyddlan-bridge, lying two miles on a south trend. The principal intercourse is by steamer from Liverpool, with passengers and goods, for the watering town of Rhyl, and those proceeding to Conway and Bangor through Abergayle. The steamers, by managing to leave Liverpool at three-quarter ebb in strong westerly gales, or at low water in moderate weather, pass along shore by Hoylake, Helbre, and Point of Air, to arrive at *high water*, before which it is scarcely approachable.

Tidal Establishment at Voryd.

The tide here flows upon full and change ☽ *thirty-seven minutes past ten*, rising in the bed of river abreast of jetty 15 feet on equinoctial springs, 13 ordinary springs, and 11 upon neaps; and its entrance, opening on line of shore, is rendered to the eye by a *telegraph* and large farm, situated on the *western* point of the entrance.

Relative position of CHESTER BAR on this line of Coast.

Chester Bar, before defined, lies upon the following relative bearings and distances, viz. from

Point Lynas .....S.byE.¼E....28 miles.

Great Ormshead	E. by S.½S.	12½ miles.
Voryd Telegraph	N.E.¼E.	5 „
Voel Nante Telegraph	N. by W.	5 „
N.W. Light-ship	W.¼S.	7½ „
Point of Air Lighthouse	N.W.¼N.	5¾ „

These bearings refer to the *Bar Buoy;* a large *black nun*-buoy, marked '*Bar,*' which lies in 12 feet at low water, denoting the *northern* danger-side of the bar, and the western spit of West Hoyle; to clear which (if rounding from the northward and eastward when the buoy may be adrift) you have a sensitive leading-mark afforded, by *bringing a remarkable blue peak,* many miles inland, *on with the western slope of Moel Hira Hill,* bearing S.¾W. [view K], and hauling in across the bar directly the Point of Air Lighthouse bears S.E. upon which bearing the southern shoulder of Heswell Hill should appear a sail's breadth (1 point, or 11°) open northeastward of the Lighthouse* [view L]. These marks or buoy will guard you from that fatally-remote sand called 'Blaney Patch,' or bank, upon which the Lord Blaney, steamer, was wrecked, with all hands, in December, 1833, on the night the N.W. Light-ship was driven from her moorings: whilst, however, She *retains* her station, you are clear of all (within the range of her lights) so long as Crosby Light (red) *is open to the northward* of her, say a handspike's length, *i. e.* ¼ of a point, or 2° on the sextant. Besides Point of Air Light, the Trinity Board provide 26 buoys in this estuary, 14 of which, as a part of my recommenda-

Bar Buoy.

Cross-Mark for clearing West Hoyle Spit.

Blaney Patch, why so called by me.

Long Night-Mark for clearing it Northward.

Buoys of the Dee.

* See particular description, page 6.

tion in 1835, were added in June, 1836, and 2 more in March, 1838.—[*See Notices in Appendix.*]

Coast and inland feature identifying the shoulder of Flintshire rounding into Dee.

The principal features serving to identify this N.E. shoulder of Flintshire, and forming the *main-land* margin of the Welch Channel are, first, the smoking ore works of Tal-y-goch, abruptly rising from a long plain in the west; then *Gwanysgaer Height* (694 feet altitude); then, a mile eastward, Voel Nante Telegraph (777 feet altitude); and ⅛ of a mile on same profile, further eastward, 'St. Elmos' white summer-house (787 feet altitude); and, on the slope of the continuous ridge 1⅛ mile, still eastward, fronts you, upon a north-western aspect, the noble free-stone coloured mansion of Sir Edward

Talacre.

Mostyn, Bart. called *Talacre*. It is on the high-water shore between, but beneath the two last-named

Life-boat Station.

objects, St. Elmos and Talacre, that the life-boat house, &c. (belonging to the Liverpool Dock Trust establishment) presents itself, at 1¾ mile west of the lighthouse. Off this boat-house, and the whole line of *flat* coast-line, the low-water shore outlays in *send*-beach ½ a mile, upon a fair trend of west, to Rhyl. This flat strand may be said to connect itself with the bar and West Hoyle, in twelve and six-feet flats, upon which lies that dangerous ridge

Middle Patch and Earwig.

and spits, known as the 'MIDDLE PATCH' and 'EARWIG.' This ridge springs out from the low-water shore directly under, and due north of, St. Elmos; the twisting spit at its inner extreme is

Buoy of Earwig.

called the 'Earwig,' and is marked by a *chequered black and white nun-buoy*, between which and the

In-shore Passage.

main, coasters pass in 12 feet water at one-quarter

flood, but there is as little as 6 feet at low water. The buoy and spit-end lie in 3 feet water, and is but ⅓ of a mile from low-water mark: from this buoy the Middle Patch begins to *dry up* 2 feet, at ⅓ of a mile N.W. upon which trend it ranges, at ¼ of a mile wide, for 1½ mile, and then flattens off to the N.W. by W. in 6 and 10 feet water for 3 miles further, where it is marked by the perched can-buoy, chequered black and white, already described.

Trend of Middle Patch.

It is between the Middle Patch and west end of West Hoyle that the *Welch Channel* into the Dee is formed, deepening inwards from the bar to as much as 12 fathoms at low water, and preserving a width of ⅔ of a mile up to and round Point of Air, *until* the lighthouse bears W. by N.½N. when the *apparently* broad waters of the estuary (3 and 4 miles at high water) are divided into three channels or *deeps*, viz. *Mostyn Deep, Salisbury Gut,* and *Dalpool Deep,* neither of which lead to any landing-place at low water; nor is Dalpool approachable at all until one-quarter flood, being encompassed by a ridge of sand called Salisbury Bank, which stretches for 2 miles a ¼ of a mile wide, and *drying up* 8 and 10 feet in the line of stream directly midway between shore and shore; its upper end unites in a run of sand with the upper or eastern shoulder of Great Salisbury Bank, shutting in Dalpool by a bar of but 3 and 4 feet water, called Salisbury Bar, and its lower end unites round in 6 and 3 feet flats with the southern shoulder of 'West Hoyle' and '*Lime Wharf*,' off Helbre Island, thus rendering *Dalpool* actually a *pool* during 3

The Welch Channel into the Dee.

When Dalpool is approachable.

Dalpool sand-

bound 3 hours of a tide, but affords good Anchorage.

hours upon every spring tide; but as it retains 3 to 4 fathoms at low water, good holding ground, it is resorted to as a tide-stopping place, and, indeed, as a refuge under strong north-easters, being accessible from Liverpool Bay up Helbre Swash; moreover, vessels consigned to Chester transfer their cargoes to flats from this anchorage. *Salisbury Deep* is formed by the Salisbury Bank (described above) on the *east* and *Great* Salisbury Bank on the west, and will only be referred to as a channel to Dalpool at tide time.

Mostyn Deep.

'Mostyn Deep' lies between the Great Salisbury Bank and low-water margin of Mostyn shore, which shore trends south from Point of Air, outlaying high-water mark 1¼ mile, composed of sand and mud.

Extent of Great Salisbury Bank.

The Great Salisbury or *middle* Bank is of hard sand, *drying up* 18 feet above low-water level, stretching diagonally towards Point of Air, from the very throat of the low-water estuary, viz. abreast of 'Parkgate,' beginning with a breadth of 1 mile and continuously at half-a-mile, for a five-mile trend, and abruptly terminating in 4 fathoms water, with a *perched can (chequered black and white) buoy*, denoting its termination, and bearing from the lighthouse E.S.E. 1¾ mile; upon which line the main low-water shore outlays the lighthouse 1 mile, and is guarded by a *red* nun-buoy, (marked S.E. Air).

Wild Road a good Anchorage.

It is immediately between and above the line of these two buoys that the much resorted-to anchorage of *Wild Road* is situated; in fact, the whole 3 miles of Mostyn Deep, of which Wild Road is the entrance, affords excellent shelter for *any* number or *size* of ships;

the ground is good, the water averaging 6 fathoms, the working room from side to side better than ⅓ of a mile, with a *near* breakwater to the N.E. and S.E. in Great Salisbury, and the whole north and north-western aspect covered by West Hoyle, which stretches right across and overlaps the western point of the Dee estuary, being a 7-mile continuous sand by 2 broad, and *drying up*, above low-water level, 17 feet. The strength of tide in Wild Road does not exceed 3½ knots, and it is quite easy of access after crossing Chester Bar, already alluded to, 7 miles below, and which we will proceed to do, merely premising that the system of buoyage, like the Mersey, denotes by letters and figures the *ground* they occupy: the *red* buoys guard the *starboard* hand when running in; the *black* buoys the *larboard* hand; and those chequered, or with perch, mark such middle banks and spits as may be passed on either hand *upon the line of stream.* No distinct pilots hover about the bar; the Liverpool pilots are expected to take charge up to Wild Road and Dalpool, (called Dawpool,) where, as also at Helbre Island, Chester pilots may be got for the upper reaches, if bound to *Mostyn, Bagillt, Flint,* or up Chester Cut. The Liverpool tide-gauge table, at page 24 of this book, will apply to this navigation by *deducting* 2 feet water from the results of that table, *if on the ebb tide,* and *adding* 2 feet if on the *flood.* It is high water at full and change ☽ at Point of Air, Xh. 44m.; equinoctial springs rise XXXI feet; ordinary springs, XXVIII feet; and neaps, XXII feet. The *half-tide* level datum is XV½ feet.

West Hoyle acts as a breakwater to Wild Road.

System of Buoyage in the Dee.

You must depend on Liverpool Pilots picking you up.

How my Liverpool Tide-Table applies to the Dee.

To cross Chester Bar at NIGHT.

To cross Chester Bar and proceed into Wild Road anchorage at *night*, it must be a leading wind, *unless after half-flood*, when you may *work* in *over* Middle Patch in 13 feet; your chief guidance being *an expert lead*, never bringing the light southward of S.E. nor stand on for a moment after shoaling your water to the northward, the Hoyle Bank being so steep-to; but prefer the main, which shelves off *until* you arrive within the limits of the *red* and lower light, when the *main* sands are as abrupt; with a beating or slant wind, however, it is sure to be free from swell, and you may borrow until shoaling a cast. With a *leading* wind your first care is to bring Point of Air Light S.E. and *right a-head;* you will shoal gradually from 5 and 6 fathoms, 2 miles outside, to 2 fathoms *on* the bar, when Crosby Light (red) will have opened ½ a point southward of the N.W. Light-ship; it occupies but an instant in crossing, being but a cable's run, when you deepen 3 feet and 6, continuing to do so until you have run 2 miles, when your water will shoal up again to 2 fathoms; a few casts, whilst crossing the edge of a flat which stretches ½ a mile from the West Hoyle into the Welch Channel, where you now are, and as soon as you deepen again, haul up from S.E. to E. by S.½S. to avoid closing with the main,* when you will soon find yourself losing the upper *bright* light, and the lower-chamber *red* light opening *out*, with 11 and 12 fathoms under you;

Don't spare the LEAD.

When you are on the Bar.

Expect the Upper Light of Point of Air to change its order.

* The stranger should be apprised, and the occasional trader reminded, of the deceptive effect of this line of coast at night. The high land appears as if sloping steeply to the *water-line;* whereas, the marsh land and beach outlie *a mile and a-half.*

observe when the red light masks or bears S.W. and haul S.S.E.¼E. edging gradually to a *south* course, which will bring on shelving soundings off *main* shore on your *starboard* hand, and any time after the principal light (upper and bright) bears N.W. you may round to the eastward and let go your anchor in 8 fathoms, stiff ground, in *Wild Road*, sheltered from all sea that, even at high water, could affect 'ground tackle,' and from whence, in daylight, you can, if so bound, proceed to Liverpool at half-flood, by way of Hoylake, the wind being *leading* so long as *any* westing is in it.

When to Anchor in Wild Road at Night.

To cross Chester Bar with *daylight*, you have the bearing-course and Heswell Land in conjunction with Point of Air Lighthouse, viz. the lighthouse open of the southern shoulder a good sail's breadth, *i.e.* one point of the compass, or 11° on the sextant, and bearing S.E. [view L]. This line of direction will carry you two cables *southward* of the *black* nun *bar*-buoy, and you will be *on the* shoalest part (12 feet low-water springs) directly the buoy draws on your larboard quarter, bearing *south*, and the long line of heavy breakers trending N.W. abeam of you from the *dry* high-back of West Hoyle over your larboard cat-head, with the short breakers of Middle Patch on your starboard beam and bow, will at once point out the *channel* water, giving the chequered black and white nun-buoy of Earwig a broad berth of a mile to the southward, bringing the lighthouse a point on the starboard bow as you advance, and looking out for the next buoy, a red nun (marked Air), which guards the *steep* low-water

Leading-mark for crossing Chester Bar by DAY.

Watch the *breakers of* West Hoyle and Middle Patch.

edge of sand beach ½ a mile directly off (N.E.) the lighthouse in 4 fathoms; passing this buoy on the starboard beam and keeping away S.S.E.½E. another *red* nun-buoy (marked S.E. Air) will appear, and must also be left on the starboard hand. This buoy lies in 2½ fathoms, close to the low-water margin of *main* shore. Your course now will depend on your intention, whether bound to Wild Road anchorage merely, to Mostyn Quay, or to Flint Reach and Chester Cut, by way of Mostyn Deep; or intending to bring up in Dalpool: if the latter, you must be sure it is not earlier than half-flood, nor later than half-ebb, according to which you should bring up *abreast* of S.E. Air Buoy, to enable you to weather the spit of Great Salisbury on the flood time. If for Wild Road, then edge from S.E. Air Buoy *south*, leaving the *perched black and white chequered buoy* (marked 'Salt. Mid.') two cables on your larboard hand, and bringing up as soon as the lighthouse bears N.W. From this position you can drop up Mostyn Deep for smoother water, on a S.E. by S. course, for 2½ miles, by merely keeping between the *black* buoys which guard the edge of Great Salisbury, and the *red* on the margin of the main low-water shore, called 'Mostyn Bank;' but I would not go higher than the red buoy, (marked M 2). The previous *red* buoy (M 1) guards the low-water edge of main, and points out the entrance to *Mostyn Gut*, an artificial channel of 1 mile long, direct up Mostyn Bank to a quay, at right angles to the deep upon a trend of W.S.W. This channel is marked along

Buoys off Point of Air.

Prepare for altering course according as you may be bound.

Anchor if not for or through *Wild Road.*

Mostyn Deep.

Mostyn Bank.

Mostyn Gut and Quay.

its southern or larboard-hand edge by broom-headed perches, admitting two vessels only *abreast*, and affording but 5 feet water up to the quay at 5 hours' flood; nor exceeding 12 feet upon springs and 6 upon neaps, high water, alongside the coal stages. Mostyn Quay is situated 3 miles S. by E.¼E. of Point of Air, on the western shore of the Dee, and immediately connected with the turnpike-road which skirts the adjoining hills, and winds along high-water mark from *Flint, Bagillt, Dee-bank Quay, Greenfield,* and *Llanack-y-mor,* all smelting stations; each of which are so remote from the main channel course, (the Bagillt Bank driving it off 2 miles,) that but *spring tides* afford *direct* shipments from their several jetties. Mostyn Quay, therefore, may be called the principal shipping place below Chester Cut, and it does ship off, in vessels of 100 and 120 tons, quantities of coal and metal, and can accommodate, in a dock, from 20 to 25 vessels at a time, in 12 feet water. High water, full and change ☽ Xh. 40m. Liverpool steamers, by leaving at two hours' flood, can make a pretty direct passage to Mostyn Quay down the Rock Channel, through Hoylake, and through a four-feet swatchway which divides the southern shoulder of West Hoyle from Salisbury Bank, and marked by a *red* can-buoy, called 'Welchman's Gut,' which buoy must be left on the northern hand; or, if absent, bring *Hoylake Parsonage* (white) *on with north end of Middle Helbre Island,* (E.¼N.) until the white toll-house at Mostyn Quay bears S.W.½S. when you can shape that course, and cut off the distance of

Its Tidal capacity.

Its accommodation and trading purposes.

Route of Steamers to and from Liverpool.

Buoy and Leading-mark across by Welchman's Gut.

rounding Great Salisbury Spit, by taking *direct* through Salisbury Swatchway, only taking care to give the *black nun-buoy*, which marks the *deep* side of swatch, half a cable berth on the southern hand; the same course, allowing a little for tide on beam, leads to entrance-buoy at Mostyn Gut. This swatchway having 10 feet at half-tide, and obviating the rounding of Salisbury Spit against a flood-tide, is often the means of a steamer effecting a landing and shipment on the same tide, by the saving of time alone.

Salisbury Swatchway.

Its Tidal advantages.

Proceeding by Mostyn Deep through Bug Swash.

Should you be bound to Dee-bank Quay, or Bagillt, or Flint Jetty, from the Mostyn Deep anchorage, you can proceed up the deep E. by S.½S. from M 2, red, and at the distance of 1 mile, the spit buoy of 'Bug Swash,' a nun, with perch, and chequered *red and white*, M 3. This buoy marks the fork-spit which divides the course of the remainder, or '*cul de sac*,' of Mostyn Deep from Bug Swash. Bug Swash is a crooked narrow *half-tide-way*, connecting Mostyn Deep with Flint Deep, of only a cable wide, and upon a *changeable* trend of S.S.E. 3 miles long. *Three* buoys partially mark its course; 2 black, B 1 and B 2, point out the two *steep-edge* curves of Great Salisbury on the *eastern* hand, and *above* them, on the western hand, is a *red* buoy, M 3, guarding the eastern elbow of Bagillt Bank, which here outlays the high-water mark 2 miles. Between these two last buoys, and, indeed, abreast of B 1, pools of 2 fathoms are retained at low water; but intervening shallows of 5 feet will permit coasters to traverse the swash until

Bug Swash Buoys.

Bagillt Bank.

two hours' flood, and *then* beware of the protruding elbows, as the tide rushes 5 and 6 knots. This swash extends ¾ of a mile S. by E. from the red buoy B 3, carrying but 6 feet, and concluding in 2 feet water at the fork-spit of Great Salisbury, where the *river*-course ascends in S.S.W. trend to Flint Castle, prominent to view at 3 miles distance; and like all the other jetty places on this western shore of Dee, conspicuous by tall smelting chimneys. This course of 3 miles is literally up the inclined *gutter*-bed of the *river*-water, without any tidal water between four hours' ebb and two hours' flood: it is scarcely a cable wide, but is assisted by 2 buoys; a *red* one (marked Elbow) the first mile, denoting the edge of Bagillt Bank on the *west*, and a *black* buoy (marked Flint) the second mile, denoting the edge of 'Neston Sands,' on the *east* side. Of course these variable channels, Bug Swash and Flint Gutter, can only be navigated by local coasters, either to the entrance of Chester Cut, or to Flint Jetty, where 16 feet on springs, and 8 upon neaps, enable tidal intercourse, flowing upon full and change ☽ Xh. 51m. The gutter which connects Dee-bank Wharf with the main channel, sweeps and pours over Bagillt Bank for 2 miles, in a southern curve from the junction-fork of Bug Swash and Flint Deep; it is marked at its entrance and on its south edge by broom-head perches, that are changed in position, but in same order, as the gutter varies; and at ½ a mile from high-water mark a branch gutter is forced by a fence up to *Bagillt* Quay, where small craft can lie and take in coal,

Great Salisbury Upper Spit.

Flint Deep bounded by Bagillt Bank and Neston Sands.

Flint Jetty.

Dee-bank Wharf.

Bagillt Quay.

pig lead, or land ore, &c.; the approach admitting 4 feet water between three-quarter flood and first-quarter ebb, during which time a ferry-boat generally effects a trip to and fro with passengers and cattle, between Bagillt and Parkgate, a much resorted-to bathing-place, lying directly across the estuary on the Cheshire shore, upon the bearing of E.½N. 3½ miles; 1 mile above which (Denhall), the estuary is indeed *fordable* direct to Flint Castle from half-ebb to half-flood.

Parkgate.

Dee fordable from Flint Castle to Denhall, at half-tide.

Since we anchored abreast of S.E. Buoy off Point of Air, the *western* branch of the Dee navigation has been availed of, and all its connecting gutters, with the shipping places up to *Flint*, described. We will now proceed from the same tide-stopping anchorage up by *Salisbury Gut* Bar and Dalpool to Parkgate or *Flint*. Now, if 12 feet water will answer your draft, you may weigh at two hours' flood, when you will not find less than 14 feet between all the buoys. Your first care is to pass a cable's length *northward* of the *perched black and white chequered buoy*, (marked 'Sal^{y}· Mid.') which points out the fork-spit that divides Salisbury Gut from Mostyn Deep, bearing from Buoy ('S.E. Air') S.E.byE. This gut trends S.S.E.¾E. 2½ miles, carrying 4 and 5 fathoms at low water; it is ¼ of a mile wide at the upper and narrowest part, with a black can-buoy guarding its eastern side (marked 'Sal^{y}· B^{k}.') and lying upon the *steep* western elbow of the Salisbury Bank; leaving that buoy on the larboard hand, another buoy, *black and white chequered*, presents itself, (marked 'Sal^{y}· Bar,') at

The *Coaster's* branch of Dee availed of from Point of Air.

Salisbury Gut.

once denoting the southern extreme of Salisbury Bank, and the *north* end of Salisbury Bar, whilst a *red* buoy, (marked also 'Salv. Bar,') ¾ of a mile S.E. of the chequered buoy, denotes the *south* end of this ridge or *bar;* and by hauling *eastward between* them, you are *instantly* in Dalpool Deep, with an increase of 3 fathoms water; and if designing to take up anchorage for shelter—shift of wind —to go down channel—or unloading into Chester Flats—you should be prepared for rounding to the northward, and dropping anchor *at once,* before the five-knot tide can hurry you up southward of the *red* bar-buoy. Here, with Kirby Church bearing N.E. by E. and with Grange Mill just open of the cliff-end, nearly on same bearing, and 1 mile abreast of you, you will have 4 fathoms stiff ground, ½ of a mile swinging room, and protected, even at high water, from much cable straining, by the projection of *Lime Wharf,* and high part of West Hoyle, in the *northern* aspect, and the over-lapping of Salisbury Banks, to the *westward.* But if bound higher up, to discharge a coaster's cargo in Parkgate Deep, you must keep a S.E. course, which is the trend of the deep and course of stream; and ⅔ of a mile on the eastern hand, a *black can-buoy,* marked 'Cawdy,' guards the low-water projection of *main* shore, which here presents a patch and elbow-feature of '*Skear,*' or loose rocky bed, called *Cawdy Blacks,* exactly ½ a mile off the cliffs; giving this buoy a cable berth, on larboard hand, and still closing with the main, upon a S.E. course, you come to a *black and white can-buoy,* called '*Deeps*';

Salisbury Bar.

Dalpool Deep, its purposes—when, or what marks to anchor.

Proceding from Dalpool to Parkgate or Flint Deep.

Cawdy Blacks.

which, on leaving *close* upon your *starboard* hand, and steering *South* and S. by E. (parallel to the cliffs, ¼ of a mile abreast,) leads up 'Parkgate Deep', where you may anchor in 14 feet at low water, or drop up the in-shore gutter, to Parkgate-terrace, to lie in 4-feet water, or ground, as your object may propose. If, however, you are bound to *Flint Deep*, the 'Deeps' buoy must be left on the *larboard* hand, steering S.¼E. which will bring you to a *red* can-buoy, (marked '*G*$^{t.}$ *Sal*$^{y.}$') 1¼ mile farther up, lying at the eastern elbow of 'Great Salisbury', denoting the western side of this 'Flint Deep', where 12 feet water is retained at low water. From this buoy your course of S. by W. will bring you up this 'two-cable-wide' deep, to another buoy, chequered *red* and *white*, and marked 'Flint Deeps',) 1 mile distant, guarding the western or starboard hand, upon the S.E. elbow of the 'Great Salisbury'; from whence, a S.W. course, in ½ a mile run, brings you to the Fork-spit Buoy, *red nun with perch*, which divides the Flint stream from the *Bug Swatch;* to which buoy our first route, up the *western* branch, brought us. It need only be remarked that the courses and bearings given in our *ascent*, or inward-bounder, apply to the outward-bound craft, by simply reversing, for the *ebb* is subservient to the same channel-directed stream as the *flood*, with this mutual exception, viz: the last-quarter *flood* has a tendency to *draw* over the *southern* margins of the channels, and the *first*-quarter *ebb* to *draw* over the *northern* margins.

How to navigate Flint Deep to Flint Quay or Chester Cut.

The directions *reversed* will take you to sea, but *beware* of difference of *ebb course*.

There is another less tortuous and, to vessels from

the northward, much shorter passage *into the* DEE. It has been fully described at page 89, as the *Helbre Swatch;* it will therefore suffice merely to revert to its leading features here: the best water on its bar is 10 feet at low-water springs, 18 low-water neaps, or 25 feet at half-tide; but as the flats intercepting Dalpool do not admit 12-feet draft until two hours' flood, the bar can only be considered as an impediment to vessels seeking shelter in a gale at north or west. The bar lies ¾ of a mile S.½E. of the N.W. Light-ship. It would be *day-light,* of course, as a single *light* bearing *astern* cannot guide you any distance between shoals. If thick weather, you have 3 quartered *red and white nun-buoys* on the starboard hand, and 3 *black can-buoys* on the larboard, all marked HE; but if clear weather, the two *Helbre Beacons,* represented in view J, (and plate of elevation figures,) brought in line, (on bearing of S.½E.) will lead you up until abreast of HE 3, red and white buoy, when you must haul south-westward round to *Mostyn Deep,* through the *Welchman's Gut,* or for *Dalpool,* upon a S.S.W. course for two miles. The *black nun-buoy* (marked *Seldom-seen*) guarding that patch of rock* at the western elbow of the Helbre Strand, called *Lime-wharf,* should appear on your larboard hand, with Grange Mill and Kirby Church in one, bearing east; from thence haul S.E. for one mile, which will place you at the same anchorage in Dalpool, a ½ of a mile N.N.W. of Salisbury-bar Buoy, *red,* already described and conducted to in page 115.

Helbre Swatch reverted to as another Channel into the Dee.

How to proceed from N.W. Light-ship by day.

* Called *Seldom-seen,* from being so often sanded over.

Sheltered anchorage afforded near Helbre Island until half-flood.

Should you be too early upon tide, or mayhap on a *falling* tide, anchor when you have approached Helbre Island, so as to have the Upper Hoylake Lighthouse and Bidston Lighthouse in one, bearing E. by S.¾.S. or when Hoylake Hotel locks with north extreme of Helbre Island, bearing E. by S.½S. coaxing up as close as possible to the high shoulder of *West Hoyle* Bank, which will be high up (17 feet above low-water level) on your starboard hand, affording you perfect shelter until half-flood, when you will have 17 feet water into *Hoylake!* across to *Mostyn Deep!* or up to *Dalpool.*

HENRY MANGLES DENHAM.

60, *Pall Mall, London.*

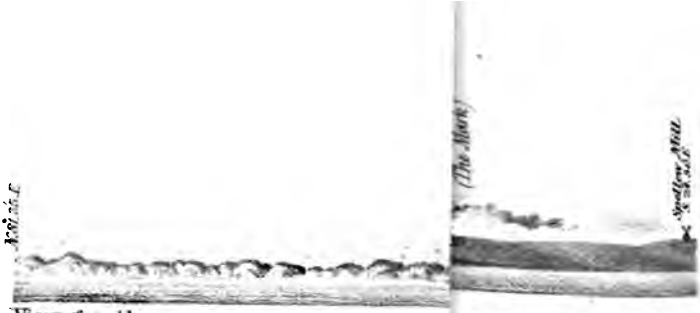
INTRODUCTORY NOTE.

In the foregoing pages, certain rules, comments, and indeed anticipatory arguments, have been advanced, that can only be relieved from *assumptive* inferences, but by annexing the abstract data from which they emanated. Therefore, the following papers and diagrams are submitted, in appendix, according to the order of research and record. The inquiring mind of some, and mayhap the perception and influence of others, may be moved to recognise in these documents the principles and experience upon which the *successful* propositions for Harbour-improvements have been *founded*, for LIVERPOOL and elsewhere, by

H. M. DENHAM.

View e and f

The cross Mast (bearing S.E. by S.)
Formby S.E. Mark its apparent breadth



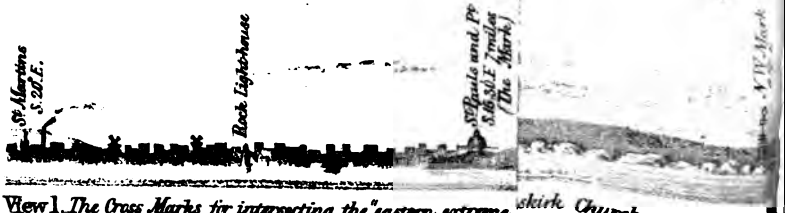
View g and h

Formby S.E. Mark its apparent

/bearing S.S.E.½E. h

View j The long mark for intersecting the "Western
Western margin of Jordan Flats forming
on with the centre of Fort / bearing S by E ½ E

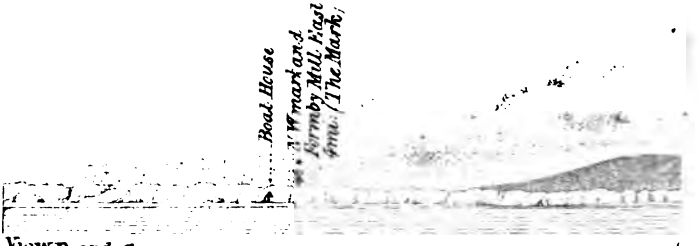
urbo" forming New Channel
Life boat-house (bearing E.



View l. The Cross Marks for intersecting the "eastern extreme
Channel viz. St Pauls Ch. twice its apparent breadth, o

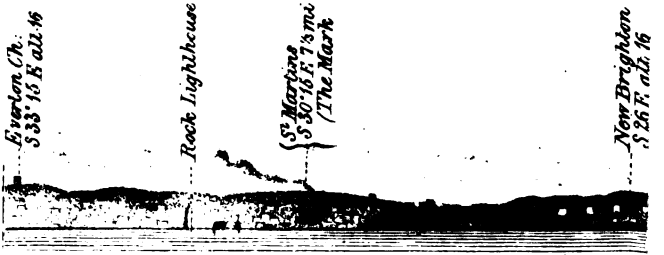
skirk Church, on with the
for this (with reference to S

View n *The cross Marks for intersecting the North extreme of Jordan Bo*
Church on with south side of Formby Ch. (bearing S E by E ¼ E) an
in one with the Life Boat house (bearing S E ½ S.)

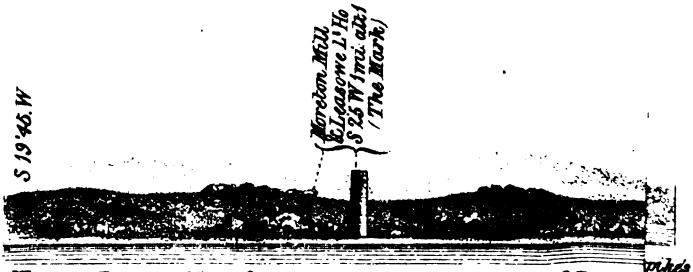


View p *and* q

Formby Mill and N W mark in one (bearing



View r. *The long Mark for intersecting the 'New Channel Bar*
St. Martin's Ch: and Musgratts Chimney appearing between the N
Fort (bearing S S E ¼ E) the leading Mark N affords the cross ma

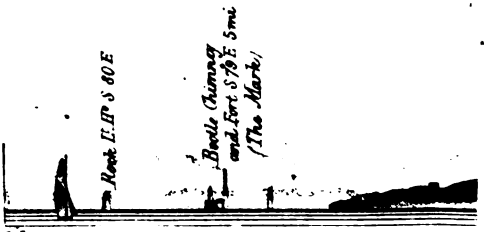


View t. *The cross Mark for intersecting the East End of Beggar* *ike's*
Moreton Mill twice its aparent breadth open Ear *to this*

ns of Jordan Bi
by E½E½ and

aring

Low Brigham
S. 26 E. 12, 16



Views V and W

The Bootle Chimney just open of the S

View X. *The long Mark for intersecting viz. The Rock L.H. just open on the N S by ½ S / The View applies to this as a*

View Z. *The cros L.H. twice its a*

Views aa and bb

The

Grange Mill right over

by W ¼ W

of the

Averton Ch.

View. c.c. *The viz.*

View d.d. *The Cross Marks for intersecting the 'Western ext And Med Hirn in one with Milliden Hill*

View e.e. *The Cross Marks for intersecting the S. E. Extreme, of dry, of Midd*

locking with West side

Views g.g *and* h.h. *The Cross Marks for int*

APPENDIX.

ADMIRALTY SURVEY, *Liverpool, Dec.* 22, 1834.

SIR,—In reference to the Chart of the approaches to Liverpool, emanating from my Spring operations of 1833, and published by the Dock Trust last August; it has been my anxious object to test, on every subsequent opportunity, those salient confines of the several channels which must ever be, more or less, naturally subservient to the friction of so powerful a reflux of tide as the Mersey *fortunately* impels. Therefore, whilst extending a course of connected development across the tidal influence of the Dee and Voryd, during the present year, we have, from time to time, carefully watched and delineated the gradual progress of nature upon the ground we *first* explored; and having portrayed all relating to these rivers, upon the same comprehensive scale, we have *clinched* the deeply-interesting work, by eventually grafting it with the western limits of your recent local publication; so that at the actual consummation of the whole survey, *this month*, we have ascertained the positive effect which a lapse of sixteen months has wrought in the contour depths and elongations of the several escapes which the Mersey makes into Liverpool Bay; and as such escapes form, on the other hand, the *'portals'* of this great port, so should no time be lost in bringing home to the mind's eye of its anxious guardians the *final results*. I have, therefore, drawn the changed and additional configurations (upon the accompanying engraving of our early fruits in the undertaking) *in red;* first for the information and discussion of the Committee, and then for the guidance of the engraver, who should be forthwith instructed to correct and improve the plate accordingly.

It was in anticipation of such operations of nature, and the design of ultimately blending the topographical feature, as well as introducing elevation views illustrative of the leading-marks, that only 300 copies were struck off for immediate maritime circulation. It is therefore *opportune*, when another batch is in request, that matters *are matured* for perfecting a second edition.

Adverting directly to the respective alterations, they consist of—an elongation of the Beggar's Patch $\frac{1}{7}$ of a mile to the W.N.W. shallowing to 5 feet water thereat, instead of 8—an elongation of the Flats in the Horse Channel $\frac{1}{3}$ of a mile to the N.W. with a patch thereon, shallowing to 9 feet, instead of 13—a spreading and shallowing of the N.W. Spit of East Hoyle, so as to come awash, instead of having 2 and 4 feet water—a twisting and shallowing of the North Spit of West Hoyle in like proportion—an elongation of the West Middle $\frac{1}{3}$ of a mile to the N.W. shoaling 3 feet thereat, and reducing its centre part to 7 feet—an elongation of the Middle Bank $\frac{1}{4}$ of a mile to the N.W.—an elongation of the western patch of Jordan Flats $\frac{1}{8}$ of a mile to the W.N.W.—an elongation of Jordan Bank $\frac{1}{4}$ of a mile to the northward —the shrinking of the western quarter of the Little Burbo, and its general decrease of 2 feet in height—the Four-fathom Flat, off the New Channel, has stretched itself $\frac{1}{2}$ a mile to the westward, whence it shelves off in a five-fathom tongue $1\frac{1}{4}$ mile further westward, terminating at $2\frac{1}{4}$ miles N.$\frac{1}{4}$W. from the Light-ship. [*Note.*—8 fathoms still exist between this tongue and the light-ship, but as it springs from the reflux trend of the New Channel scouring, so is it likely to grow up.]—lastly, and most importantly, a knoll of sand has grown up in the bay of 2 miles circumference, (with as little as 14 feet water on its crown,) situated $2\frac{1}{4}$ miles E.$\frac{1}{4}$S. from the outer Light-ship; *certainly* within a line drawn from her to the New Channel, but imperatively calling forth a conspicuous 'warning buoy'; for, though out of actual track to either channel, yet ships of moderate draft, standing off and on, might be *fatally* intercepted; and as it evidently owes its birth to the depositing confluence of the ebb streams of the Burbo openings and Horse Channel, so does it threaten to grow up *rapidly;* indeed, so active is the vortex, that we find it 7 feet nearer the surface than when its foundation was gauged in 1833; and as no such inequality appears in any previous chart, I have designated it as the 'Newcome.'

It is a matter of true congratulation that, on reverting to the various workings of tidal as well as boisterous influences, during the last 16 months, nothing, *as yet*, has transpired to interrupt the scheme of *unlimited* navigable intercourse so memorably promulgated last August; and I cannot but anticipate the glowing satisfaction of the authorities, in thus beholding their anxious adoption of measures (for facilitating the protection of life and property) so *promisingly* founded: a sort of

annual proportion of change has now been determined, 'tis *true;* but as sportive freaks so often manifest themselves amongst sands, so will it not permit a progressive calculation of *how long* things will *continue within certain limits.* We see, however, the *treacherous portions,* and zealous skill may so profit by their *apparent* dispositions, as to *accommodate* the buoys and beacons, so as to *preserve* the technical scheme consistent with *occasional* editions of the Chart. You are aware, sir, that when formerly introducing the several important *new* features into your navigation, I *abstained* from interfering with the original and *accustomed* buoys, wishing to let the *innovations* first work their way *alone,* lest we might be accused of taxing the mariner's mind too much at once. I cannot, however, consider our labours perfect without submitting, at this season, a list of such of the *present* buoys as I would shift into *better* positions—a list of such *additional* buoys and beacons as I conceive due to the mariner's advantage—and a list of those buoys which, by inadequate moorings or other causes, differ most materially with the sites they occupied when the Chart was published. The first two lists, as quoted, gives their respective character, with the *cross-marks* and *sextant-angles* for deciding their sites; the latter list will suggest the desirability of some adequate remedy, inasmuch that the liability is disappointing, if not fatal, to the mariner, and an injustice to the Chart. It behoves me also, sir, to submit a mode of classing the buoys according to the actual initial of each channel they are to occupy, whereby carrying the numbers into *teens* will be avoided; which will facilitate identifying any particular buoy when intercepted in thick weather, as well as allow any alteration in its class without breaking up a line of such numbers as XVIII, &c. which now exists. Moreover, *can* and *nun* buoys may (instead of being promiscuous) be arranged so as to help, at *first sight,* to distinguish the channels.

In conclusion, sir, I beg to observe that such part, or all, of the foregoing as may be adopted, can, in ten days, appear upon the new edition of the Chart; and a simple local notice will familiarise the pilot with these auxiliaries to his pursuits.

The possibility of this being the last contribution of our feeble, though *earnest* exertions in the cause of your local maritime intercourse, has prompted me to embody all that occurs to me since my last visit to the *channels* on the 19th instant, in this communication. Our hands are likely to be incessantly occupied for a time with the

compilations of the last two-years' survey; but we *already* see new fields of work in prospective array; and be assured, sir, that *go where we may*, it will be a proud retrospection to my brother officers and self, the *conviction* of *how much* MAY be done for a local cause, when punctilious adherence to *mere duty* does NOT restrict the mental and bodily resources to lukewarm and convenient exercise—if we assume then—a *merit*; it is because we feel our anxious efforts have rather *surpassed* duty, and defeated invidiousness.

I have the honour to be,
Sir, with much consideration,
Yours, very obediently,
(Signed) H. M. DENHAM, Lieut. R.N.

To C. HORSFALL, Esq.
CHAIRMAN OF THE DOCK SUB-COMMITTEE, LIVERPOOL.

At a Meeting of the Dock Committee, January 13th, 1835,

PRESENT,

CHARLES LAWRENCE, Esquire, Chairman,

&c. &c. &c.

The following Resolution of the Sub-Committee appointed to superintend the alterations and improvements of the Buoys, Lights, &c. &c. having been read, viz :—

"At a Meeting of the Sub-Committee for superintending the alterations and improvements of the Buoys, &c. January 10th, 1835,

PRESENT,

CHARLES HORSFALL, Esquire, Chairman,

Sir JOHN TOBIN,	Captain SMITHETT,
Mr. LEATHOM,	Lieut. DENHAM,
Captain TOWNLEY,	The Harbour Master;
Captain EMERSON,	

"Lieut. Denham having entered into a detailed explanation of the "alterations he thinks it necessary to make in the Chart of the entrances "into this harbour, in consequence of the change in the banks since "his survey about eighteen months ago, he recommended a change in "the positions of some of the present Buoys, and that several new ones "should be laid down in situations marked on the Chart, as stated in "his report on these subjects, which was read;

"RESOLVED,—That it be recommended to the General Committee "to adopt the suggestions now made by Lieut. Denham, and that his "report and detailed statement respecting the Buoys, &c. be copied in "the Sub-Committee Book."

(Signed) CHARLES HORSFALL.
(Signed) THOMAS LEATHOM.
(Signed) WILLIAM DIXON.

RESOLVED,—That the said recommendation be approved and confirmed, and that measures be taken for altering the Chart accordingly.

[Extracted from the proceedings of the General Committee.]

WM. FOSTER, Secretary.

LIEUT. DENHAM, *R.N. &c. &c. &c.*

NOTES TAKEN AND PUBLISHED OF CAPTAIN DENHAM'S PAPERS AND STATEMENTS TO THE BRITISH ASSOCIATION.

In the Geological and Geographical Section of the Dublin Meeting of the British Association, August, 1835, Capt. Henry Mangles Denham, Royal Navy, Resident Marine Surveyor of the Port of Liverpool, exhibited his Trigonometrical Survey of the Mersey and Dee, including the extensive Sand Banks and Channels of Liverpool Bay; which, being delineated on the comprehensive scale of four inches to the mile, afforded a detailed development of the sub-marine undulation, illustrative of his remarks on the action of the tidal stream, in connexion with those differently-shaped estuaries; strikingly evidencing the self-choking effects of the Dee, with its expansive mouth and gradual contraction, assuming the lateral section of a cone; and the scouring effects of the Mersey, with its contracted mouth and attenuated throat, resembling a lateral section of a bottle, with its neck pointed seaward; producing and maintaining a disgorging impetus of its expansive backwater, so as to have recently forced a channel of half-a-mile wide and two miles long, of twelve, and thirty feet, below the low-water level, through sands situated eight miles outside its coastline confines, *at a tangent to its regular course;* thus producing a most valuable and unexpected channel for navigation, whilst providing a compensating escape for its waters at a time when an inimical deposit was taking place across its usual path, where the efforts of the ebb becomes evanescent. A position ascertained by the author to be fourteen miles below the docks, or tidal straits, where the first impulse amounts and continues five hours out of six, to five miles per hour, on spring tides, clearly portraying the contour of incidence and reflection throughout its whole course, and showing the exhaustion of its velocity by expansion, in proportion of 14 to 25, and proving how singularly tenacious a natural trend of stream is of being diverted permanently; for, notwithstanding the copious outlet, assumed in a ratio of time, and progress which would predict increase of capacity; yet, no sooner has the Mersey vented itself, than it pertinaciously

resumes its original northern set, merely appropriating its superabundance westward, through the New Channel, so as to preserve its limits in *statu quo;* clearly evidencing, however, to the great public interests at stake, in that vast emporium of British commerce, the certain powers of the Mersey to command a navigable avenue to the ocean, so long as its guardians preserve the high-water boundaries from artificial contraction, and as freely dedicate dredging or harrowing means to assist the actual scour. That the actual channel of such vitally-important intercourse may be *sportive,* Captain Denham admitted himself prepared to anticipate, and felt his attention worthily, as well as deeply-interestingly occupied, when accepting a local invitation to watch and detect the salient and treacherous avenues, from time to time, during which, he proposed to himself a further investigation of the proportion of silt, &c.* held in solution and gradual deposit, as well as *defining* certain peculiarities in the vertical range of the tides with reference to atmospheric elasticity. He had already been enabled to connect a series of observations, even to five-minute grades, during the twenty-four hours, which not only determined, by extensive tabularly interpolations, the half-hourly rise and fall upon every stage of the moon, to enable the mariner, at a glance, to know what water existed in excess of his chart, and hence when certain subsidiary channels were passable, or the several banks might be crossed, but had determined the tidal establishment, or the time of high water upon full and change ☽. And, next to this valuable datum for computing perspective high waters, he had determined another constant proportion, as a standard for graduating future tide-gauge operations, to test soundings hereafter, or a point of departure for engineers, when levelling eminences, canals, railroads, &c. viz. the oscillating point or mean centre, which every six hours is common to neaps or springs, and quoted by seamen, generally, as *half-tide mark.* Captain Denham was not as yet prepared to state whether some small constant difference as to the instant of the half-elapsed time† of spring and neap high and low-water, resting moments, producing the actual half-

*See Special Report, Sept. 1837.

†Capt. Denham subsequently found the *rising* and *descent* to the half-tide mark, to occur at the third hour before and after the high-water time, and not at half-elapsed time of high and low water.—*Vide* 856 Interpolations submitted to Captain Beaufort, Admiralty Hydrographer, and Professor Whewell.

range of tide to inches; but, so satisfied is he of a closer approximation than is generally allowed, that though he would never propose to adjust soundings to that half-tide level, because the mariner would have to make variable allowances to ascertain the least water he was to expect in the channel before him; yet, he would suggest, for scientific and frequent practical references, the desirability of engraving on some rocky spot of every harbour and sheltered portions of coast, the well-defined *half-tide level*, (DATED); for, on the assumption that such a level is (no matter what the whole amount of rise and fall differs) in the same latitude, equidistant from the earth's centre, then we have a standard of obvious importance to science, that will soon manifest itself practically in adjusting those discrepancies which must always attend engineering operations, if designed to co-operate on opposite sides of an isthmus where the vertical range differs, and either high or low-water level, separately, be started from, instead of the mean centre of each range, *i. e.* half-tide level; he need only instance the discrepancy of results, which two persons of equal skill and pains-taking must produce in the altitude of any eminence above the centre of the earth, lying between the English and Bristol Channels; if each started from the relative high or low-water levels, when the actual difference of vertical tidal range is as 15 to 45 feet. Now, as six hours' operation is dedicated to each range, from high to low, or low to high water, and as the water is found to arrive at, or fall to, the half range (7½ to 22½) at three hours from high-water periods, then will each observer come to the same result of altitude at any intermediate position, by separately starting from his half-tide mark, calling each mark the nonious.

Professor Whewell made the following remarks: "The permanence of the level of mean water, which Capt. Denham has recently proved by trial, at Liverpool, suggests the proper mode of making such observations on the permanence of the relative level of land and sea. In tidal seas, the level of the ocean must, for such a purpose, be estimated with reference, not to the height of high or of low water, which is variable on many accounts, but, to the height of *mean water*."

"Sir John Franklin expressed warm admiration at the results and arguments submitted.

"Professor Sedgwick congratulated the town of Liverpool on the importance of Captain Denham's position, and the possession of such

a map and tables. He was fortunate enough, in coming through that port to Dublin, to see the progress of the investigation adopted by Captain Denham, and his enormous process of tabulation; it was, at first, a mass of apparent confusion, but he soon was enabled to see order arising out of it. He dwelt upon the great, the important point of establishing one fixed level; and he would be happy to discuss that, and other questions, with some gentlemen of the Physical Section: this, above all others, possessed more stability in its conclusions, and more nobility in its speculations.

"Mr. Murchison said this showed the intimate connexion between Geology and Geography; if this subject were followed up with that spirited enterprise, it might yet be defined, the allurement of land in one place, and its increase in another, and the rate of that increase and decrease.

"Professor Griffiths moved the especial thanks of the Section to Captain Denham, in admiration of the ability with which the map and tide-tables were executed, and the practical applications he suggests."

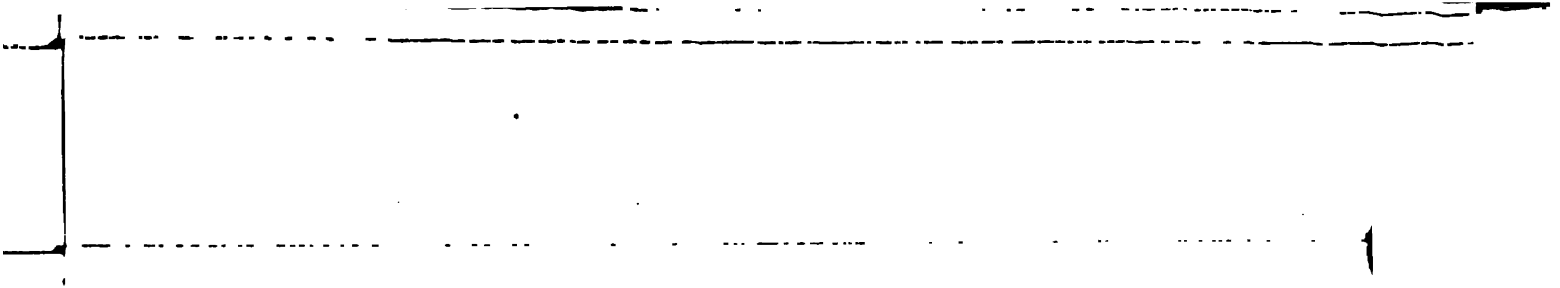
The communication of Captain Denham was enthusiastically greeted, and pronounced by all the scientific men, as one of the most important points on Physical Geography yet submitted.

Mr. Alan Stevenson, civil engineer, alludes to the above, thus:—"Similar results made by my father fully corroborate the statements of Captain Denham, and prove that at the Dornoch Frith, *a point in the vertex equidistant from high and low water of any one tide, is on the* SAME LEVEL, *or coincides with the points half-way between high and low-water of* EVERY OTHER TIDE; and 'at this point,' says my father, 'the mean level was fixed.' This point is clearly no other than that which is very briefly, and at the same time accurately, described by Captain Denham, as 'one invariable mean height, common to neap and spring tides—the half-tide mark;' and the coincidence of two sets of experiments, made at different times, and on the opposite shores of the island, without any communication between the observers, goes far to prove the universality of the phenomenon which has been detected. At the Dornoch Frith, these phenomena recurred with unfailing regularity, and appeared to be quite uninfluenced by the *age of the tides*, or state of the weather."

In the Sub-section of Physical and Practical Science, Captain Denham also explained a course of novel and interesting experiments he

had lately made, demonstrative of the relative extent of railroad vibration, imparted laterally to surrounding surface, by trains passing on that surface in *open air;* or vertically imparted to the surface, when passing through tunnels; from which it appeared to be (in reference to sand-stone formation) ten to one greater in the former case than in the latter. He suggested the desirability of making various observations elsewhere, to ascertain the comparative effects on a variety of substratum, in order to form a ready conception, when proposing any new line of railroad, as to probable and injurious effects of tremor being imparted to buildings containing delicately-adjusted instruments, &c. which a timely diversion of a few yards in the line of direction, would avoid.

Captain Denham had found, in the case of the great Liverpool town tunnel, by mercury reflecting objects to the sextent, that, whilst the train passing in open air imparted lateral vibration 1110 feet, it ceased to impart tremor vertically, from the tunnel (the intervening stratum being sand-stone), at 100 feet.



RESPECTING PLUCKINGTON BANK AND SHELF.

(Vide Plates.)

I now beg to report on the nature of Pluckington and Devil's Banks; to elucidate which, I submit a plan of the features of the river between the Rock Lighthouse and Garston, upon 4 inches to the mile, whereon courses and velocity of the flood and ebb stream are portrayed, the former in *red*, and the latter in *blue* ink; showing that Pluckington owes nothing to the flood-tide deposit, but that on the course of the *eastern* column of the ebb, does that deposit depend, and that course depends on Dingle Point; for, by practical tests on each half-hour of ebb from high or low water, we perceive its inclination to follow the trend of shore until within 100 yards of Dingle Point, which becomes so decidedly the point of deflection, as to hurry it into the deep-water column with such impetus as to blend with, and divert the whole obliquely towards Birkenhead; whereby the tidal stream off the southern portion of docks, especially King's, Queen's, and Brunswick Docks, becomes so weakened as to permit the sand, held in solution, to deposit thereat, besides being too weak to bear away the silt driven forth from the several dock sluices. The first effect of this diversion manifests itself in the formation of a shelf of sand, varying from 3 to 10 feet, under water, that springs from abreast the rocks, under Mr. Lawrence's wall, ¼ of a mile southward of the Potteries, trending obliquely towards Birkenhead, until abreast of the southern extremity of the Dock Estate, where it forms an elbow ¼ of a mile towards the centre of the river, and then trends to St. George's Dock. This shelf, therefore, narrows the river capacity, at low water, to nearly one-half what it *appears* to be between Rock Ferry and Brunswick Dock; and then the *visible* Pluckington, springing obliquely from the southern extremity of the Dock Estate, and forming an elbow off Brunswick Half-tide entrance, at an offset of 270 yards into the river; whence it trends to St. George's Dock, lateral to and within 30 yards of the margin of the shelf.

This bank outlays King's Dock Basin also 270 yards, varying from 6 to 1 feet in height, above low-water level; its highest part is off

Duke's Dock, where it *outlays* 50 yards less, but dries up 10 feet; off Canning Dock it outlays 120 yards, and dries up 6 feet: it then gradually narrows, at an elevation of 2 feet, until uniting with the base of George's Pierhead.

Taking the progress of this bank since 1822, which is marked by a green shade on plan, we have an horizontal increase of 210 yards abreast of Brunswick Basin; abreast of King's Dock 123 yards; and abreast of Duke's Dock only 40 yards. Its respective elevations I cannot quote between those dates, but since 1834 I find it grown up 1 foot off Brunswick Dock; 2 feet off Brunswick Basin; 3 feet off King's Dock; 3 feet off Duke's Dock; and 1 foot off Canning Dock; during which, its low-water margin has yielded 50 yards directly off Brunswick Basin: simultaneous with this two years' fluctuation, I find the Devil's Bank to have warped 143 yards towards the eastern shore, lowered in altitude 4 feet, but elongated towards Pluckington Shelf 250 yards; so that the spit of Devil's Bank and Pluckington Shelf is within ¼ of a mile of uniting with each other; an event to be feared, seeing that the Devil's Spit has elongated ¾ of a mile in 8 years, but which should be *averted* with all anxiety; for, on the space between them being shoaled up to a bar of six feet instead of fifteen, the Garston branch of the Mersey will scour its way through the swatch-way, just above Otterspool, dividing the Devil's Bank from Eastham Sands, and join the main column of ebb stream, down the *Cheshire* side of the river. I therefore earnestly propose that (with reference to the curvilineal boundary set forth for the future projections between the Dock Estate and Dingle Point) a river-wall should be extended, in connexion, from 40 yards within the low-water edge of Knott's Hole Rocks, scarping the edge of those rocks, and preserving a gentle concave face along the *low-water* margin of shore. This wall would produce a most sensible effect on the first 400 yards advance, by presenting a cut-water edge to the down-stream, instead of allowing the whole body of water to drive against the North Arm and Rocks of Dingle Bight, and then jerked off with an impoverished impetus, at nearly right angles to its wonted and natural course.

Its further extension might be subject to convenience of funds, &c. understanding that, as it progressed south-eastward, more decided guidance and impetus on the ebb stream would be afforded.

I will conclude this report, sir, by begging it may go hand in hand

with the local and general plans herewith submitted for elucidation to the mind's eye of those gentlemen concerned in the conservation of the Mersey and dock approaches; of the latter it need only be said, that whilst placing dock sills within 4 and 9 feet of low-water level, a bank should be contemplated with much jealousy, that not only precludes taking up early anchorage near the southern docks, but that threatens to elevate itself above the level of those sills, except in the guttering course of the gate sluices.

I ought to add, that we need not wait the connexion of a boundary wall from the docks to Dingle Point, before striking out the *cutwater* wall *southward*, but act independent and *effectively* from Dingle Point, by first projecting on the rocks 100 yards in a S.W. direction, and then vigorously working towards Otterspool.

I have the honor to be,
Sir,
Your obedient Servant,
H. M. DENHAM, Capt. R.N.
MARINE SURVEYOR TO THE PORT.

To the Worshipful the Mayor of Liverpool,
September 27, 1836.

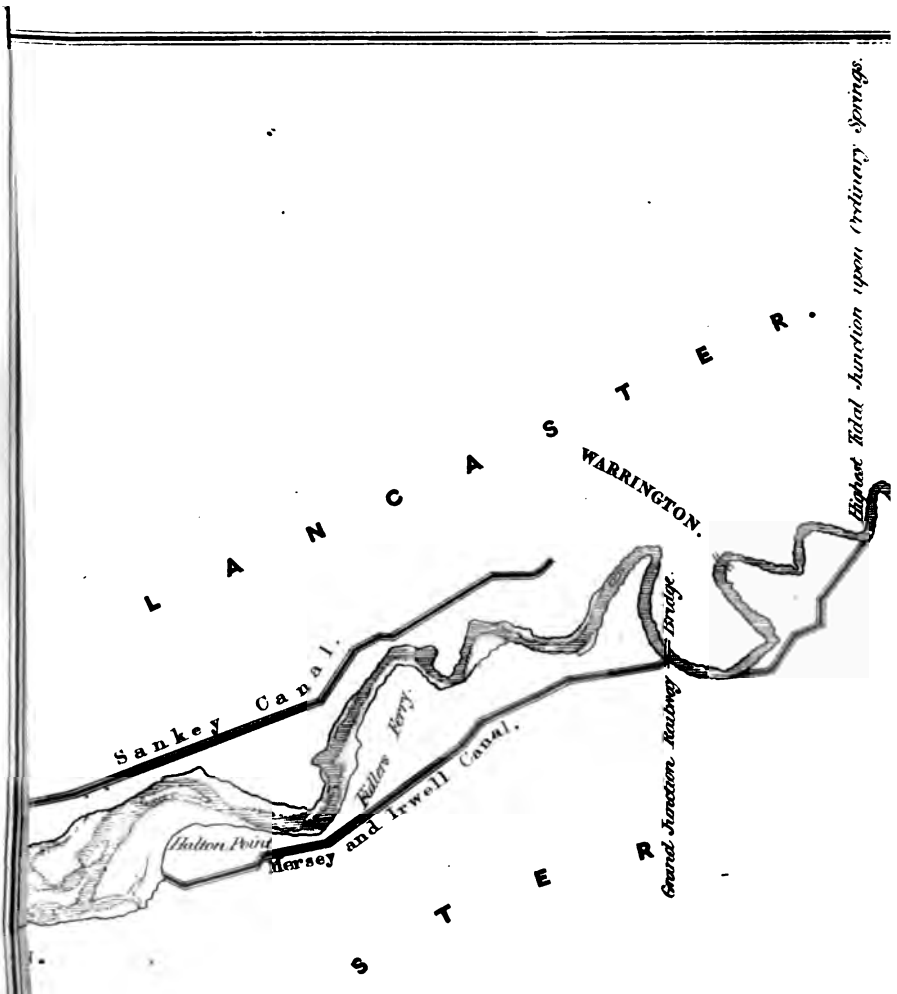
BRITISH ASSOCIATION, SEPTEMBER, 1837.

Section C.

Captain Henry Mangles Denham, R.N. Resident Marine Surveyor at the Port of Liverpool, read a Report illustrated by trigonometrical plans, diagrams, and sections, on the vertical and horizontal capacity of the Mersey Estuary and Liverpool Bay; showing the proportions of insoluble matter held in suspension during its influx and reflux, with the coincident *detection* of its predominant deposit on the *ebb*, its rate and proportion of transit in the region of deposit.

The *plan* delineated every high and low-water interstice of those two expansive and contiguous estuaries, MERSEY and DEE; minutely portraying the shoals which uncover the channels, and the under-shelfs or shallows of Liverpool Bay, embracing a range of 105 square miles outside the orifice-narrows, the space traversed by the second stage of ebb until crossed at right angles by the Irish Channel stream. Upon this comprehensive plan, the course and velocity of the whole tidal column was laid down, showing the hourly rate and deflection off each protrusion, and the consequence of eddies in intermediate curves. The *diagram* and *section* showed the relative levels of high and low-water springs and neaps, between the Light-ship stations in the bay and tidal head, or Warrington Bridge; which, in a distance of 36 miles, produces a difference of 2h. 28m. in high-water times, and 12 feet of simultaneous differences in the level of tidal surface. The progressive differences in time and altitude were marked at 6 stations between the extremes quoted, and at the especial station selected by the author, viz: the one-mile straits, just within the embouchure formed by the Rock Lighthouse main. The vertical action of a 32-feet spring, and 14-feet range of neaps, had been so noted every half-hour throughout the 24, and the high and low-water times so detected by five-minute grades,* as to show that the oscillation of each vertical range, whether it be springs or neaps, passed the same line, viz: half the spring-tide range, 16 feet, at 3 hours before and 3 hours after every high-water time, and not at the half-elapsed time of high

* Exhibiting 13,020 notations of tidal level.



Results of Data.

Cubic Yards.

The Estuary contains at High Water Springs, 719.174.880 of Water.
Do. do. do. do. do. Neaps, 292.653.200 do.
Or presents an average daily circulation of 536.914.040 do.
Maximum velocity on the Flood, 6¾ Miles per Hour,=23¾ transitus in 5.2
Do. do. Ebb, 7 do. do =29¾ do. 6.8
Greatest velocity of Flood at 3 Hours flow,=6¾ Miles.
Do. do Ebb, 2 do. Fall, =7 do.
Rise of Tides above Low Water { Equinoctial Springs, 33 Feet / Ordinary Springs, 30 „ / Neaps, 23 „ } High Water, Full & Change of the Moon,
Level in the Straits between Docks and Cheshire Shore. { Half Tide, 16 „ / All-Tides, 11 ft. 5 in. }
Proportion of Silt, Mud, and Sand, suspended in every Cubic Yard of Flood Tide, 29 Cubic Inches, and in every Cubic Yard of Ebb Tide, 33 Cubic
Diurnal transit of Silt, &c, to the Bay Area by Ebb Water, 379.054 Cubic Yard
Do. do. do. returned by Flood, 330.989 do. do.
Annual transit of matter over the outer banks and shoals at mouth of Estuary, 36.087.450 Cubic Yards.
Actual deposit after the Second Tides dissemination & consolidated bulk after tidal pressure, 11.696.817 Cubic Yards.
Actual cubical increase detected of Banks, Knowls, and Spits, in one Year. 12.296.0 Cubic Yards.
The diff[ce] 600.183 traced from flood, transmission when crossing the DEE

ng Dock, Liverpool
5
Profile of River B

w water; a point he had left open to further observation, when ncing this constant mean level in a former paper.—[*Transactions,*] Here he had determined to analyse the tide in its passage the ocean region to the estuary and back. It being evident that unceasing suspension of matter must exist, for the valley of rock h divides the Liverpool Docks from the Cheshire Shore—3 miles ; 1 mile wide, and 80 feet beneath the low-water level—is kept ured as clean as if nothing but pure water passed over it, although bruptly shoals up by deposit 70 feet at the inner end, and 40 feet the outer end of the attenuated straits which connect the bay of erpool with the bottle-like estuary of Mersey. The velocity of flood e necessary to fill this estuary, which, upon full and change ☽ con-ins 779,174,880 cubic yards of *tidal* water, he had ascertained to be, t hour, 4 miles; 2nd hour, 6¼ miles; 3rd hour, 7 miles; 4th hour, miles; 5th hour, 3 miles; 6th hour, 1 mile=27¼ transitu; occu-ying 5h. 20m.: and, on the ebb, to disgorge it, a velocity on 1st hour, 1¼ miles; 2nd hour, 7¼ miles; 3rd hour, 7 miles; 4th hour, 5¾ miles; th hour, 4¼ miles; 6th hour, 2¼ miles=31 transitu; occupying 6h. 30m. The velocity of tide necessary to supply and disgorge the 292,653,200 cubic yards of occupation at the quartering of the moon, amounts on the flood to 15 miles, and on the ebb to 18¼ miles transitu; such an impetus, it may be inferred, would dip and scour deeper even than the 80 feet below its lowest surface, which it is here known to do. The excess of velocity and time attending the egress, refers to the proportion of freshes, and *how* comparatively charged with insoluble matter had been the connecting object of the author's research, for which he had contrived a simple but effective double valve-bucket, that enabled him to bring up samples of passing stream at any depth, without mixing with the intermediate water; these samples were extracted from 6 to 30 feet at every half-hour of flood and ebb, embracing the seasons, and carried into a series which produce an average of 29 cubic inches on the flood, and 33 upon the ebb, in every cubic yard of tidal water; which, taking the average of springs and neaps' circulation, 535,914,040 cubic yards, produces 330,989 cubic yards of matter held in solution upon each *flood,* and 379,054 cubic yards upon each ebb; thereby evincing a preponderance of matter, and left in the bay upon each ebb, of 48,065 cubic yards, a diurnal deposit that, in tidal rotation of 730 refluxes, amounts to the vast annual bulk of

35,087,450 cubic yards, which, if *equally* disseminated over the *first* ebb-range (64 square miles), would produce an annual layer of 21 inches thick. It, however, is not wholly detained in the region over which the first ebb ranges and expires, but is disturbed before it can adhere by the succeeding ebb, the strength of which *begins* to night where the evanescent stage of this morning's tide deposited, extending over a secondary area of 41 miles, in which region a proportion of matter is held=¼ of that left in the primary region; and as even that which is left diminishes in bulk one-half by consolidation, the actual annual quantum of measurable increase to the shallows of the bay and approaches to Liverpool, is 11,695,817 cubic yards, which, if *that* even disseminated equally, would decrease the water by a substratum of 7 inches thick, but it is not equally disposed of; certain knowls, margins, and spits are fed, which, after attaining certain growth, elongate into fresh underlays, that, by becoming tidal deflections, keep up that sportive state of the channels which the author's survey and development of that most important navigable auxiliary to Liverpool, the New Channel, exemplifies. That channel actually lies at right angles to the mean set of stream, and broke through sometime between 1822 and 1832, scouring 22 feet for 2 miles nearly, by ¼ of a mile broad, because the deposit at the exhausting point of ebb had been gradually damming up the last half ebb, and that half was deflected and weakened by a spit stretching into the stream within the cross deposit. It is to watching and providing for such changes which so vitally concern an intercourse of 16,000 vessels per annum, that Captain Denham devotes himself, and in the course of incessant exploration of the banks and channels, he proves the actual cubical increase of the deposits in 14 years, to amount to 160,170,988 cubic yards, whilst that *detected in transit*, multiplied by the interval, would predict 151,741,438, leaving 8,429,558 as the portion resulting from chance deposits, unusual freshes, and what the Helbre Swash branch of the *Dee* sends forth into the Mersey range of the bay. There is in this first attempt to detect the amount of insoluble matter in river *transit*, such a pleasing and successful coincidence in result, that the author holds it no longer hypothetical, but a positive practical means of predicting what *every* river is journeying forth from its valleys and banks to the bars and shoals of the port below, or contiguous coast. Thus may embouchure observations *detect* and *predict* the *amount* of what is going on in the

approaches to every river, either as a guide to the engineer in his bridge or dock projections, a hint to the Marine Surveyor as to *vigilant* delineations in the navigable region, a claim upon liberal appropriation for dredging and harrowing means, and a serious appeal to the land-owner, who, for the gain of acres from the *shore* of his property in an estuary, may deteriorate it for ever, by the languishing of channel intercourse with the sea through eventual lack of back-water. The port of Liverpool vitally depends, therefore, on the most scrupulous preservation of that back-water, and *constant harrowing* process, for its present orifice impetus *barely* secures a channel before half-flood, and that too 10 miles remote from an impetus which diminishes in a ratio of expansion as 7 is to 2 in 8 miles. The successful maritime intercourse, however, at this date, sufficiently testify the effect of systematic arrangement, for out of 29,000 vessels in the two last years, but 19 got into difficulties, whilst but 2 were wrecked; and the tidal detentions of her Majesty's packets to Ireland have been reduced from 261 to 30 instances in a year, since the New Channel has been developed, lighted, and buoyed.

The Marquis of Northampton gave Captain Denham's experiments as an example of the importance of the British Association and of its peripatetic character. The important port of Liverpool has been ever in great danger of having its navigation seriously injured by the accumulation of silt at the mouth of the Mersey. In which argument Mr. Greenough, Professor Sedgwick, and Mr. Griffiths agreed; whilst Mr. De La Beche pointed out the great importance of these experiments both to the scientific and the practical man, in affording information concerning operations and works on the banks of estuaries and rivers. He conceived that the utmost caution should be used in making embankments, as, in most instances, they had proved detrimental to the navigation. The Rev. Mr. Yates spoke also of the enormous quantity of silt, determined by Captain Denham, as being of vast importance in illustrating the opinions of Mr. Lyell, on the changes produced on the earth's surface by causes still in operation. He alluded to a communication some time ago by Mr. Horner on a similar point, namely, the quantity and quality of earthy matter contained in the Rhine.

BRITISH ASSOCIATION, Friday, September 15, 1837.

Section A.

Captain Henry Mangles Denham, R.N. Marine Surveyor and Inspector of Lighthouses, &c. at the port of Liverpool, made a communication, exemplified by apparatus, "on producing a red light with more brilliancy, economy, and convenience, than hitherto adopted."

The section room was, on this occasion, closed up with green baize screens; when Captain Denham exhibited a parabolic mirror of 22 inches diameter and argand lamp of 1 inch diameter of burner. He stated that one of the modes of distinguishing one lighthouse from another in the same region, to the approaching mariner, was by giving a *red* colour to the light.

This had hitherto been effected by placing a screen of glass, coloured red, completely over the apertnre of the mirror, from lip to lip; certainly producing a red light, but so impoverishing the rays which had thus to pass *through* it as to yield a dull heavy light; that double the number of lamps and reflectors could not compensate comparatively with the plain or uncoloured lights; moreover, the straining weight of those screens upon the fitments, especially of revolving lights. The constant accidents to such fragile sheets of glass, being in plates of 24 inches diameter, by changes of temperature, removing every 2 hours at night for snuffing and trimming the lamps, also in conveying them to the lighthouses, made an improvement most desirable. He had, therefore, adopted a red-coloured glass cylinder of about 9 inches long and 1¼ diameter, in lieu of the screen alluded to, which cylinder also superseded the plain glass chimney hitherto used with the screen; thus reducing the operation of the light-trimmer to merely that which attends the uncoloured lights, the red cylinder producing proper tint, giving steadiness to the flame, and carrying off the smoke at the same time; the convenience being one-fiftieth, the breakage and expense one-eighth; whilst the brilliancy and consequent penetration of dense atmosphere proportionably good, as the tinted *rays* had no glass medium to pass through, and the lamps were not so shut up from the

necessary circulation of air which they require. These advantages and recommendation had been for some months experienced at one of the lighthouses under his charge, viz. 'the Rock' revolving light, showing plain and red light alternately. It was also intended to produce a desired alteration in the colour of Formby Light, by the same simple means, next November.*

But, in the interim, he availed himself of the opportunity of exhibiting it to this section of the Association in the presence of Sir David Brewster, Professor Peacock, and Professor Farraday. Captain Denham then had his lamp lighted, and upon placing the red screen on the reflector, it obviously had the effect of very sensibly diminishing the intensity of light; he then removed the screen and plain glass chimney, and merely put on the burner his *red glass cylinder*, and the light was scarcely less intense than without its interpose, and yet sending forth a decided *red light*. He explained the precautions necessary to avert abrupt change of temperature when placing them on or taking them off the lamps. The auditory of the section, amongst whom was his Excellency the American Charge des Affaires, Mr. Stevenson, testified the strongest satisfaction at the decided practical improvement; whilst an interesting discussion between Sir David Brewster, Professors Farraday and Peacock, in reference to the scientific principles, which Mr. Peacock closed by observing, that he did not consider the section competent to express an opinion as to its general adoption.

* Subsequently, the Formby Light, Liverpool, has been exhibited on this plan, with every satisfaction. The Trinity Board have been supplied with the red glass cylinders; also, the engineer and superintendent (Mr. Robert Stevenson) of the Northern Lights Commission; likewise, the Danish Lighthouses.

To the Dock Committee, Liverpool.

Marine Surveyor's Office, June 12, 1838.

The Marine Surveyor having reported the progressive alterations in the New Channel, as developed by especial local examination from time to time, since his general survey of 1834; and the Dock Committee having approved his various suggestions for preserving, as much as possible, the original mode of 1834, for navigating that channel; whereby, as many as 12,000 vessels have passed, uninterruptedly, in a year, two-thirds of which have been effected during the four-hours' tidal-period of each day that the Rock and Formby Channels are closed against intercourse with the port. But such detection of *channel* alterations, adjusting of the buoyage and lights, and the revision of chart for publication, being necessariiy blended with the watchful routine of his whole charge in the bay, and subject to the precarious opportunities and uncontrollable operation which a sailing vessel and rowing boat imposes: the gradual development has been confined, in the interval alluded to, to the marginal feature and salient points of the sands. As, however, such changes have become very sensible during the last 9 months, and so absolutely *sudden* within the last 3 months, as to seriously indicate that a simultaneous eruption *has and is* taking place in the 12 square-mile region; comprising the 'Formby Middle,' West Middle, north part of Burbo, Little Burbo, and *Jordan Flats;* the absolute nature of which it is imperatively essential to portray on a new diagram of trigonometrical points, from a minute course of soundings and tracking of the low-water margins; so that the Committee may contemplate the undulation and set of tide in the whole region, from a plan on their table, with the propositions;—whether, of *instantly deepening* certain parts by *artificial means*, or publishing the actual features with adjusted buoyage and lights *for the ensuing winter*,—involve considerations which will not allow the Marine Surveyor to hesitate apprising the Committee cannot be done *prompt* justice to, if subjected to the dilatory, and he really believes impracticable process of uniform accuracy, by sailing or boat means of obtaining

data; for, when a working breeze exists, she must be kept in *safe* water, without the possibility of taking true soundings connected with sextant angles, or the advantage of plotting the positions at the instant; and when a light breeze, she becomes dormant and unmanagable, must be instantly anchored; whilst, from a boat, the flat-land objects of Formby and Crosby, 7 and 8 miles distant, can rarely be discerned, especially at low-water periods; moreover, the tardy movement and fatigue of rowing across the incessant tide, *limits each day's progress.* He therefore feels it incumbent on him to request authority to hire a small steamer to obtain defined data, in time for Committee's determination before the Autumn months set in; and which, he anticipates, will not exceed 25 days of the ensuing six weeks; or, an expense of £200. His tide-gauges are planted, and points laid down, so as to commence on the Monday after authority; and as much of the weather and tidal opportunities will be taken advantage of, by keeping the ground as many nights as possible; and, as the Tug Company are willing not to charge the nights, if taken by the week, it is desirable to try the first hire by the *week;* when it will be evident whether by week or day will best economise the time and sum appropriated, which it will be the anxiety of the Marine Surveyor to abridge the expenditure of, on every account.

H. M. DENHAM,

MARINE SURVEYOR TO THE PORT.

To the Dock Committee, Liverpool.

Marine Surveyor's Office, October 4, 1838.

The Marine Surveyor submits to the Dock Committee a plan of the New Channel region, comprising the channels, banks, and shallows, for five miles upon every point of the compass from the bar of the New Channel; lateral and transverse sections of that bar; and a chart, exhibiting, at one view, the amount of changes which have taken place in an interval of four years, viz: between the Autumn of 1834 and the present Autumn.

The object and import of these documents are to show, that unless artificial means are forthwith resorted to, the port cannot continue accessible at low-water periods.

The New Channel has been navigated with most valuable success for those four years, and even up to last August, 1400 passages per month were effected through it; and tidal detentions of her Majesty's Mail-boats reduced from 261 cases in a year to 10. Such free and vitally-important intercourse must *now* be subject to a slight restriction, and will assuredly cease to exist at all if left to itself. The *first* formation and *trend* of this channel predicted, however, the changes which, from time to time, have been detected, reported, and *provided* for; and have lead to that close and simultaneous scrutiny of the whole tidal range in Liverpool Bay, in order to detect any opening which *might* be taking place whilst the crisis (apprehended this Autumn) of the first entrance to the New Channel '*sanding up.*' Every square yard of the region was therefore surveyed and gauged, by the Marine Surveyor, last June; when, so far from discovering even a *promise* of a compensating clearance through the swatches of Burbo or Formby Flats, even the Rock Channel evidences a progressive choking up. No where, in fact, does any thing present itself which, even by argument, can divert our whole *attention,* and *energies, and* MEANS, from being dedicated to what remains of the 'New Channel'; and those remaining and altered features evince every disposition of the stream of ebb to assume a *natural* and, therefore, permanent course. It should be reverted to, that this Channel first opened at nearly

right angles to the course of the reflux column of water; a perversity, which has aggravated itself each succeeding year, until the once parallel-sided channel becomes a crescent figure, with its horns pointing to the predominant stream. The concave part of the crescent is bounded by the southern edge of Little Burbo, which constitutes the north margin of the Channel—where the tide has so bored and scooped, as to produce in its consequent deflection a progressive deposit round upon its south-western horn, which has spread the original bar to thrice its breadth, and contracted the passage *over it* from ¾ of a mile to ½; and this contraction is unfortunately progressing at a much quicker rate than the unassisted scooping and scouring of the tide upon Little Burbo proceeds; so that, in about six months, it is most certain a ridge of only 7 feet water will *unite* right across the present New Channel entrance—assuredly leaving us, for an indefinate period, shut up for four hours out of every twelve. It is to avert such a calamity to this busy port, and avail of the intervening months, that the Marine Surveyor suggests and urges an immediate dredging or harrowing process at the bight of the crescent already produced by the direct set of tide. A measure not only justified by having patiently refrained from exerting artificial means, but peculiarly invited and encouraged by the present process of nature, and the under-water features within and without that bight. In the former, we have the fact of Little Burbo Bank receding a quarter of a mile, and lowering its surface 7 feet *by tidal influence alone*. In the latter, we have an inner pool of water ready to unite with an outer sea, from their relative beds, which beds incline from *in* to *out* 43 feet in a mile, and are only intervened by a ridge of sand of 1300 yards by 600, and of 4 to 6 feet in height between the 12-feet draught line of navigable waters. From the succession of flats and spits which are growing and outlaying the original *embouchure* of the New Channel, and the evidence we have of the treacherous effects of tide thereon, it would be futile and endless to attempt its restoration; but in the space marked on the plan, in red, A, B, C, D, and the trend of ebb shown by arrows,—a sudden transit into a muddy dyke of 25, 35, and 43 feet water, at low water,—presents an invitation, and justifies the prospect of a better channel than ever into the port; inasmuch, that it will be upon a fairer trend up to the docks; a truer course of tide, and from the great and constant depth directly *outside*, will not be restricted to a production of 12 feet

water; for why should it cease until the 24-feet bed *within* is continuous with the 24-feet without?

The most simple and economical means (without trenching upon any patented plan) which occur to the Marine Surveyor, for producing the connexion of a twelve-foot column of water at low springs, is by towing, with a steamer, a flexible harrow, made of lengths of old chain cable, spiked at intervals and spread on a beam of African oak, towards the towing span, with their ends connected with a double saw-toothed scraper; such can be made out of our refuse mooring chains, so that with the additions, the machine will, according to Mr. Molyneux's estimate, cost £68. A model has been made to help the description upon ½ an inch to the foot, the real length and breadth of it will be 30 feet by 24, and the chains 1¼ and 1½ inch iron.

The preparatory step and expense will be the laying down 12 iron anchor buoys, along the margins of the proposed cut, these will be painted green and marked to prevent mistakes and interruption; their cost, with distinct chains and sinkers, will be £114.

The steamer's work will be confined to 7-day courses at this season, that being the number of days of alternate weeks which produce an ebb tide during day-light. The process would be commenced at H.W. and continue till the fifth-hour ebb, dropping the harrow (or harrows) with a buoy to it, wherever it might happen to be at the stated hour. The period of low water would then be appropriated to gauging the section, to ascertain progress. The tide averages a rate across the ridge of 2 miles per hour, a promising power for carrying off all we disturb; and as none of the sand would be disturbed within an hour of low water, the *flood* will not have any additional matter suspended in *its* course, whilst all that *does* go out on the ebb will have ample depth to deposit in upon that particular line. Supposing then that we deepen the area 6 inches every alternate 7 days, it would occupy twelve of those intervals to deepen the desired 6 feet, making 84 days' hire of a steamer between the 15th inst. and the 31st of March, which, at £8 per day, would cost £672; which, added to the denoting buoyage and cost of scraping-machine, will amount to £854.

Anticipating a successful issue to the proposition, (which will manifest itself one way or the other in the first month's essay,) the Marine Surveyor next submits his mode of rendering the New Cut navigable by leading lights and buoys.

The Committee will perceive, on applying the detached drawing of the prospective Channel to the existing one, that the Formby *Shore* Light can no longer be subservient to a leading line. It will be shown directly how, even with the present bar, its operation is too undefined for low-water periods. It is therefore a consequence, that the present Lighthouse would have to be abandoned; to prepare for which, he proposes another, either upon Crosby Point or upon that high part of Formby Bank lying one mile towards the Light-vessel. This bank dries up 10 feet above low-water level; and besides being nearer the mariner's eye, and so much clearer of the local miasma, would be on more independent ground. The Marine Surveyor submits a plan of an Iron Lighthouse, drawn under his direction, and estimated at £2050; but if Baltic timber were substituted, £1700. Such a Lighthouse could be *moved* to another site in a month. Mr. Mitchell foregoes, in this instance, the 500 guineas' fee which the Trinity Board have given him for his Patent-screw Application in building a Lighthouse for them on the Maplin Sand. Should the main land be preferred by Committee, an elevation and ground plan, obtained by the Marine Surveyor, is also submitted; which will cost, including the fences and outbuildings, £1350, the ground rent depending on bargain. In neither of these estimates are the lighting fitments included, as they will be easily transferred.

These considerations will not be considered premature when, if the success of our New Cut is evidenced in a month, the Lighthouse must be *commenced*. Mr. Tomkinson, who drew the plans according to the Marine Surveyor's directions, likewise undertakes to have it completed in four months.

The Marine Surveyor has now to request Committee's attention to an immediate exigency. The Formby Light-vessel's berth is so encroached upon by the breakers of Taylor's Bank, as to require moving for safety; and as the sanding-up of the Half-tide Swatchway has also taken place, and another Swatchway opened its breadth westward, it is proposed to move the vessel ¼ of a mile W.¼N. of her present site. Her application then, and the necessity of announcing the present bar not approachable during low-water springs, and the moving certain buoys, are all set forth in a proposed advertisement herewith submitted. And, in order that the present state of that navigation may be understood, and, conjointly with my Chart of last year, the Channel and

approaches made the most of, it is suggested that a lithographic copy of the drawing, exhibiting that region, may be issued with the notices: the cost will be only fourpence a-piece whilst the act will be replete with information to the meanest capacity.

The Marine Surveyor having, in his recent survey, detected the presence of *mud* where sand existed, and as the Committee will detect, at a glance of the comparative shoals and banks of 1834 and 1838, the extensive growth of those deposits, he cannot refrain from again entreating that so unjustifiable an aggravation to the growth of our almost overwhelming shoals, as casting the Dock mud into the river really is, may be discontinued. The Dock Surveyor states that it amounts to 96,000 cubic yards yearly: a later information says 66,000. Another mode was proposed, and lodged with the Dock Surveyor by the Marine Surveyor in December last, pursuant to a conference ordered by the Committee.

In conclusion, the Marine Surveyor cannot help expressing a conviction, that a better Channel than ever is within our reach; and should his simple assurance impart but half of the confidence to the Dock Trustees, which his proving to them the actual state of the Port's approaches on this day four years did, he shall congratulate the continued devotion of his energies to the cause.

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

To the Dock Committee, Liverpool.

Marine Surveyor's Office, Liverpool, Dec. 24, 1838.

The Marine Surveyor having, during his charge, contemplated the several Lighthouses and Light-vessels with much anxiety in not being provided with lightning conductors, and having taken pains to satisfy himself as to the most simple and effectual mode of providing them, now submits to Committee the sort of conductors he would recommend, and the combined estimate of furnishing and fixing the same.

It is proved that *any* thickness of copper rod, sufficiently strong to stand the wind and weather, is ample to ensure the safe conduct of electricity to the earth; also, that any metal about the roof or upper parts of a building or vessel, (of which our Lighthouses and Vessels abound,) should be *connected* by wires *with the conductor*, whereby, those fears usually bestowed on lead roofs and elevated metal fitments are not only dispelled, but *rendered sources of safety* to the fabric. To attach lightning rods to the seven Lighthouses and twisted copper rope to the two Light-vessels and tender, (the latter was struck and damaged but lately,) with copper eyes for fastening them firmly down the interstices of the buildings and shrouds of vessels, would require 244 yards, which Mr. Adie, optician, of Bold-street, Liverpool, will supply at 11s per yard, amounting to £134 4 0

The labour of two men, say 2½ days each at Lighthouse, going to and fro, expenses, &c. estimated at 18 15 0

£152 19 0

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

Read,—*Postponed!*

CAPTAIN DENHAM'S SUGGESTIONS

RESPECTING

AN OBSERVATORY,

ADDRESSED TO THE TOWN COUNCIL COMMITTEE,

January 5, 1839.

Presuming the *désirableness* to be already evident, I need only premise my propositions with such remarks on the practical extent contemplated, as will account for the selection of site, and the comparatively meagre outfit I have to suggest.

The ostensible and positive object of an authorised and publicly-supported Observatory, at Liverpool, is (as set forth in a memorial from the Literary and Philosophical Society of Liverpool, of which I was the mover,) solely to afford the means of regulating chronometers upon as positive a datum as Greenwich Observatory possesses, and to impart the local attainment with equal facility to the navigation. Hence, we must compass, as contiguously as possible: 1st. The aspect and freedom from tremor required for astronomical observation: 2nd. The transmitting instant time by signal to shipping in dock, but chiefly in the river: and 3dly. A chronometer depository, conveniently accessible to the shipmaster. Now, were we only desirous of a site for *observation*, and transmitting the results by signal or journeymen chronometers, then our site *might* be on the Cheshire side of the river, with some local recommendations; but, as the shipmasters' business lies on the Liverpool side, the consulting his convenience will prove no trifling promoter of the boon intended.

It appears to me that the three essentials quoted are offered at the Custom-house, for there is a main cross wall coming up from the foundation into an attic, a few yards directly west of the dome; the attic becomes the Observatory by merely opening a doorway from the staircase, flooring it, opening two slits in the slates in the southern and northern horizon, fixing two stone pedestals for the transit instru-

ment on the cross wall, *and* fitting a couple of roof sashes for light. A trigger apparatus can be communicated from this Observatory up inside the dome, so contrived, that the signal ball should be made to appear ten minutes before *noon* of each day, and instantly to disappear below the apex of the dome *at noon*, quite concealed from view the rest of the twenty-four hours. A chronometer-room could be appropriated from the several apartments at the foot of the attic staircase, and which, being but one flight above the long-room landing, may be said to lie almost in the track of a shipmaster's arrival and departure. Certain carpenter's fitments would be required in these rooms, for berthing each ship's chronometer under charge of the astronomer until it was called for; and should the ship afterwards be detained in dock, or in the river, the shipmaster could (without disturbing so delicate a piece of mechanism as his chronometer) test the rate given him by the astronomer by daily observance of the twelve-o'clock signal; and thus avert the present risks of concussion which handing it to and from the chronometer-makers' shops entail. I perceive also, contiguous rooms on the second floor adapted to lodge the assistant astronomer. So far, I assume a *site*, and the first step after equipping it or any other in the region of Liverpool, must be the fixing its relative meridian with Greenwich; for it is a reproaching fact at this moment, that such is not settled within as many seconds as would throw a ship out of her longitude five or six miles *on the day* of starting: besides the loose mode of even *rating* the chronometer. This step will be accomplished in less than the first month, as the Astronomer Royal has already proffered a co-operation which will effect it. I had the satisfaction of assisting to set Bristol right on this point in ten days, though each batch of chronometers had to be conveyed by the high road: our *railroad* facility brings us *within that* interval of time for transit of Greenwich time. Our local care is, then, to establish means for ascertaining *true time at Liverpool*. On this, the skilful adjustment of the transit-instrument axis vitally depends, and which the solidity and aspect of the place I recommend, will admit. It is true that the dome of the Custom-house cannot be seen from the northern docks; but no building exists of stability or altitude that can command the whole line—nor is there any but artificial ground, as you advance towards the convex face of the dock walls, that would permit a building of sufficient elevation, or ensure freedom from

vibration to the transit pedestals, not to mention the immense cost. All the outward-bound vessels in the river, however, would be commanded from the dome, and the majority of docked vessels; whilst the most tangible advantage contemplated, viz: depositing chronometers for care and regulating, would be, as it were, at the clearing-out point.

In enumerating the instruments for this Observatory, I consider the object so purely local, in the outset at least, and sources of astronomical phenomena so abundantly provided at the public Observatories of Greenwich, Edinburgh, and Armagh, that, although it will be a most laudable and honourable appropriation of such local funds as shall eventually place Liverpool on equal terms of contribution to science—besides the occasional interception of phenomena, which, from state of atmosphere, may be lost to either or all of the other Observatories, and the frequent satisfaction of comparative observations on the same phenomenon; and which the site I propose is eminently calculated for, seeing that it is on the *windward* aspect of the prevailing winds, from whence no smoke or murky weather arises. My list, therefore, is reduced to the lowest that *can* fulfil our professed and simple object. But in the constitution of the establishment, the consideration of the astronomer should be in anticipation of abilities and respectability, apparently more than commensurate to the *one* object; for, in him should be blended the examining and abstruse knowledge required for adjusting the local magnetic deviations of every ship of the port—especially those constructed of iron, or loading with iron. Many a ship leaves our shores, and is registered as *foundering at sea*, whilst as likely to be lying at the base of some rock or headland, towards which her course has unconsciously been made, owing to her compasses pointing from 1 to 3 points, (an *iron* vessel will actually present an error of even 9 points) through local attraction being unprovided for. At a slight expense of instruments he could also produce such meteorological data as would contribute most valuable comparisons—a branch of science every day, we perceive, being reduced to tangible utility. We should also contemplate in such an appointment, the proficient examiner in navigation of all persons entrusted with the charge of ships—a routine most devoutly to be looked for. In fact, he should be a standard of reference upon all scientific questions, and in his situation and support should be reflected the judgment and liberality of the local authorities. He should be independent of all fees, and yet the uses of the Observatory

should be subject to a fee, and that a compulsory one upon every ship going foreign. I conceive 5s a year would be most cheerfully paid—whilst, on the other hand, the depository being free, would be but partially availed of, and less appreciated.

It occurs to me, that a legislative clause, to authorise all the propositions, would be most easily obtained, and then the establishment would support itself.

In concluding these opinions and suggestions, I should anticipate a remark, viz: that as we are many days altogether without the sun appearing, so would the time-signal be deferred, and that too, when a ship would be on the start with a S.E. wind;—I would reply, that the uniformity of solar and sideral clocks in the Observatory would afford the invisibility of the heavens for *weeks*. It does, however, often and fortunately happen, that, after the artificial atmosphere of a town has obscured the sun at noon, the stars become cleared at night, when the astronomer avails himself of such as are predicted to culminate.

I annex the list of equipment and estimated expense of the whole outfit of the establishment.

I shall be ready to accompany the Committee to the site, or explain, in person, any part of the foregoing; and shall congratulate myself indeed, if, in any way, I can promote this, or a better devised plan, for mitigating the national loss of property occasioned by shipwreck. I need only remind a committee of discerning gentlemen, that the extent of those calamities amount to *three millions* per annum, the value of which, though covered by insurance to certain parties, is not the less lost to the nation; besides the incalculable loss of seamen to the country, and heart-wringings of society.

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

To THOS. BLACKBURN, *Esq. Chairman of the Observatory Committee, Town-hall.*

SPECIFICATION AND ESTIMATE.

ESSENTIALS to constitute a local Observatory, having in view the attainment and transmit of *true* time for the rating of chronometers;

with means of registering meteorological data and tidal phenomena at the port of Liverpool. Submitted by Captain Denham, R.N. to the consideration of the Committee appointed by the Town Council to report on the desirableness and practicability of such an establishment.

INSTRUMENTS.

A Transit Instrument, of not more than 3½ feet long, might be got at Simm's, 136, Fleet-street; Dolland's, 59, St. Paul's; or Jones's, 62, Charing-cross, for £60

A good Sideral Clock and a good Solar Clock are expensive when new, but might be got on hand, each 40

A Barometer and self-registering Thermometer, a Wind-gauge, a Rain-gauge; these vary in prices, but need not exceed..... 80

EQUIPMENTS.

Stone Piers, and other fixing apparatus, generally depends on locality; in this case about..... 70

Signal-pole and Ball, with lever fitments for pole and trigger-movement for ball; may be applied to the site proposed for about 200

Fitting-up rooms, and introducing slit shutters in the roofing availed of at Custom-house—need not exceed 250

Total Outlay..... £700

ESTABLISHMENT.

One Astronomer (a graduate, if possible)—salary £500

One Assistant—salary, £100, and lodgings in the building, or £40..... 140

One Messenger and Office-cleaner, combined—salary, £50, and lodgings in the building, or £20 70

Books and Stationery, Coals and Candles—say 60

Annual total Establishment..... £770

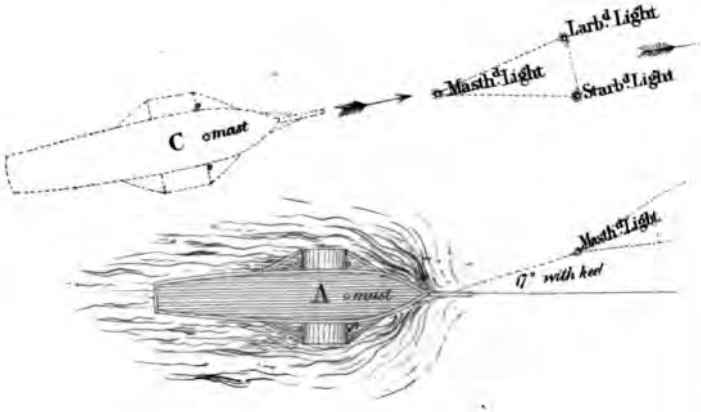
or, after the first year, the Astronomer might have the option of taking the fees and £100 salary, and find the assistance, &c. himself.

N.B. An Equatorial Instrument and a self-registering Tide-gauge should be provided as soon as possible, if not in the outset—combined cost, £500.

No Reply!

A Diagram illustrati
One at the forepart of each
Starboard side of each to b

B having discovered A after his Star



Ordered to be Printed by the House of Commons June 1st

CAPT. DENHAM'S

REMARKS AND PROPOSITIONS

RESPECTING

STEAMERS' LIGHTS, AND PASSING EACH OTHER;

OR IN REFERENCE TO SAILING VESSELS.

(Vide Diagram.)

No general system of lights exists at Liverpool; some carry three lights, one at foremast head, and one at the fore part of each paddle-box; some carry the upper light at the fore part of the vessel; some carry a red light on starboard paddle-box, and a plain light at the opposite paddle-box and mast-head; some carry lights on their quarters; some a middle light at the bowsprit end: all, however, attend to one rule, and that is, in passing each other on their starboard sides; but I understand the reverse is observed at other ports, which has naturally been attended with collision when a Liverpool vessel gets amongst them. Now it is to be wished that a compulsory general rule were introduced; and I submit that three plain lights, one on the foremast head, and one on the fore part of each paddle-box, (not to throw any light abaft the beam,) cannot fail to indicate the position of the vessel. And as it is most important to know when the rule should be departed from (as in the case of two steamers suddenly discovering each other in rounding a point of land, or closing in a fog), I propose that the starboard paddle-box light should be masked, so as to cross the line of keel direction, at an angle of 17 degrees, towards the larboard bow. It would then be simply thus; if you ever perceive the three lights of a steamer, (which must be in a vertical triangle, if ever seen at all,) on your larboard bow, then you must starboard your helms and cross to the right side, until respectively on the starboard bow of each other. If, however, you do not see the three lights, it is

certain you have so advanced on each other's forward track, as to have shut in the starboard light; and if you attempt to recover the right side by crossing, you will, in all probability, run into each other. It is then that the rule should be abandoned, and each vessel keep her previous course. I annex a diagram to explain my plan, and have assumed the starboard side as the *rule* side. The plan will apply conversely.—In the case of other craft and steamers, I can only suggest, that whilst the steamer must in all cases give way (or stop, if risking a shoal); yet it should be imperative that the sailing vessel show a light over her quarter towards the approaching steamer; of course, the showing the lantern in time depends on the look-out on board sailing vessels; a fixed light on each quarter of sailing vessels would be well when in pilot waters. This is a point not at all settled, as regards Liverpool; vessels at anchor, however, are expected to keep a light up at the fore-stay.

Although a wide circulation of the following Notices took place at their respective dates, they are inserted here by way of summary of the progressive additions and alterations in the Buoyage, Lighting, &c. during my charge of the port's navigation.

H. M. DENHAM,
CONSULTING MARINE SURVEYOR.

NOTICE TO MARINERS.

Dock Office, Liverpool, July 8, 1834.

The Trustees of the Liverpool Docks and Harbour hereby give notice, that the undermentioned additions and alterations for the better guidance of the Mariner, *into and out* of the port, will be exhibited on and after the 1st day of August, 1834, viz:

"FORMBY LIGHTHOUSE."*—This building (hitherto known as

*Resumed its character of *Land-mark*, 1839, and Crosby Lighthouse took up the line with a *red* light.

Formby S.E. Landmark) will present a *steady yellow light,* ranging 12 miles in a Western aspect, between the points of S.W. and N.N.W.¼W.; which limits indicate, respectively, *when* a vessel is Westward of "MAD WHARF," and *when* she ought to shape the fairway course of S. by E.¼E. up CROSBY CHANNEL."

The most brilliant portion of the said Light will be shown down the "NEW CHANNEL," *in concert with* a "FLOATING RED LIGHT,"* exhibited from a *single-masted Vessel,* (painted red, with a red flag to distinguish her by day) moored in 16 feet at low water, 3¼ miles W.¼N. from Formby Lighthouse—¼ of a mile Southward of *Jordan Flats*—and ¼ a mile Westward of the *Spit of Formby Bank.* These Lights, *brought in a line,* lead direct from seaward, upon a course E.¼S. to the *entrance* of, and *through* the New Channel (which carries 12 feet *at low-water Spring Tides,* over its outer and shoalest part,) up to the Floating-Light. Both the above lights may be discerned, in clear weather, as far as two miles Westward of the N.W. Light-ship.

The New "FORMBY RED† LIGHT VESSEL" likewise serves, *(when brought in a line with the Black Rock Light,)* to lead through Jordan Flats, in 17 feet water at *half-tide,* upon a S. by E.¼E. course; and the narrowest part of this *Swashway* is distinguished by *two Nun-Buoys,* (white, with a black vertical stripe,) ¼ of a mile apart, and about ¼ of a mile Northward of the vessel, the passage being *between* the said buoys.

An additional RED CAN BUOY is also placed on the Western side of the Crosby Channel, to denote the Easternmost elbow of "GREAT BURBO." This buoy lies in 16 feet, close to the bank, and bears from the Black Rock Lighthouse, N. by W. 3 miles; it is the Southern-most red buoy in Crosby Channel, and must always be left on the *Western* hand.

The "HELBRE SWASH MARKS" will be removed on the day above mentioned from *Helbre Island,*—one to the small islet called the EYE, and the other to the flat shore immediately Eastward, and at ¼ of a mile from Helbre Island;—so that, *when brought in a line,* they lead direct from the N.W. Light-ship, up Helbre Swash, upon

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*† Altered to plain light, and exhibited a ball instead of flag, 1839; also the bearing of leading line altered to S. E. by E.¼E. through New Cut, and S. by E.¼E. through Half-tide Swatchway.

the course of S.¼E. to the first Log Buoy on the S.W. elbow of the East Hoyle Bank.

And to afford the clearest illustration how the foregoing arrangements contribute to open the navigation into and out of the port *at all hours of tide*, the Dock Trustees have published a Chart thereof, in conformity with the recent Admiralty Survey, by Lieut. Henry Mangles Denham, R.N. (under sanction of the Right Honourable the Lords Commissioners of the Admiralty,) upon a scale of 4 inches to the mile; which may be had of all the Chartsellers in Liverpool.

NOTE.—*All bearings and courses in the above imply by Compass.*

By order of the Committee,

WILLIAM FOSTER,
SECRETARY.

NOTICE TO MARINERS.

Marine Surveyor's Office, Liverpool, August 1st, 1835.

(ALL BEARINGS IMPLY BY COMPASS.)

The Trustees of the Liverpool Docks and Harbour hereby give Notice, that, in accordance with the Survey of Captain Denham, R.N. the following improvements have been adopted in the *Lighting, Beaconing*, and *Buoying* of the approaches to the port, viz:

POINT LYNAS LIGHT.—This Light, hitherto so situated as to preclude seeing it seaward, and merely shown by a single reflector upon *long shore* aspects, is advanced to the *pitch* of the point, and exhibited from a castellated building (with *white* basement) recently erected thereon, with a powerful steady* light, of the natural colour, produced by 13 argand lamps and reflectors, ranging over 211 degrees of the northern and south-eastern horizon, at an elevation of 128 feet above half-tide level, rendering it visible in clear weather 6 to 7 leagues from a ship's deck; or, within 1 league of taking up the N.W. Light-ship, off Liverpool. This light is so masked for local inshore effect, as to become obscure when brought eastward of S.E¼E. *which clears the* MIDDLE MOUSE ¼ of a mile, or northward of N. by W.¼W. *which clears the* DALLAS ROCKS ¼ of a mile, and indicating when you ought to tack *out* of "RED WHARF BAY."

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* A flashing light now, 1839.

The FORMBY FLOATING LIGHT* shows a natural colour with increased power, in lieu of the red light formerly exhibited.

The ROCK LIGHTHOUSE will exhibit a *black ball* above its balcony, whilst 12 feet water remains in the "*Rock Gut*" by day, and a steady light (from a lower chamber in the western aspect) will indicate the same by night.

A FLOATING BEACON is moored at the NEW CHANNEL Entrance, presenting a black conical figure, bearing this inscription: "*New Channel E.¼S.*" and surmounted by a large black ball, elevated 23 feet, with a self-acting bell.

NEW CHANNEL LANDMARK.—†In order to render the line of leading objects into the New Channel more available in hazy weather, or accidental absence of the Light-vessel, a dark bulky framework has been erected on the high-water shore of Formby in line of Light-vessel and Lighthouse.

HOYLAKE LIGHTHOUSES.—These buildings, in order to distinguish them more effectually from the neighbouring houses, are painted *white*.

DOVE BEACONS.—*Two* beacons appear on Dove Point instead of one, affording a leading mark, *when brought in line* upon the bearing of S. by E. for passing between the Dove Spit and East Hoyle, in reference to the eastern entrance of Hoylake.

The BUOYS are distinguished by the *initial* of the Channel or Bank they respectively occupy, *i. e.* F. *Formby*; C. *Crosby*; N. *New Channel*; HF. *Half-tide Swatchway*; H. *Horse Channel*; HE. *Helbre Swatch*; R. *Rock Channel*; L. *Lake* (Hoylake); B. *Beggar's Patch*; K. *Knowl* (Newcome). They are likewise *numbered in rotation*; No. 1 always denoting the outer or seaward buoy of the channel its letter indicates, and the turning point or *elbow* of each channel is marked by a *perch-buoy*, bearing in mind that *red* buoys lie on the *starboard* hand, and *black* upon the *larboard*, when running *in*.

ADDITIONAL BUOYS.—*Eighteen* additional buoys are laid down, (making 56 in all,) and thus disposed: *one* Red and *one* Black on each side of the New Channel, between the present buoys; *one* Red on the eastern edge of Jordan Bank, between the present buoys; *one* Black on the edge of Formby Bank, next northward of Crosby Buoy; *two*

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* Two lights contemplated, 1840.

† Removed, and a similar one erected in concert with Crosby Lighthouse, 1839.

Black on the low-water edge of Bootle Sands; *one* Red on the edge of "Rip Raps;" *one* Red on the edge of Mockbeggar Wharf, between the Dove Spit and West Wharf Buoys; *one* Black and White on west end of Beggar's Patch; *two* Red on the east edge of East Hoyle Bank, within the present buoys; *two* Red and White on the west side Helbre Swatch; *two* Black on the east side of Ditto; *one* White, with black stripe, showing the fairway of Half-tide Swatchway, 1 mile westward of Formby fairway Buoy; *one* Red on the edge of Hoyle, in Hoylake, abreast of the Church; and a Black (Nun) Buoy, (marked K 1) upon that part of a shoal now called NEWCOME KNOWL, which has lately grown up so as to have but 14 feet water upon it at low-water springs,—this buoy bears from the N.W. Light-ship E.¼S. 2¼ miles; and from the New Channel Floating Beacon S.S.W.¼W. 2 miles.*

The whole of the foregoing is clearly shown and explained in the *completed* Edition of Captain Denham's Survey of the appoaches to Liverpool, now published under sanction of the Right Hon. the Lords Commissioners of the Admiralty.

By order of the Liverpool Dock Committee,

H. M. DENHAM,

MARINE SURVEYOR TO THE PORT.

N.B.—The Navigation of the Port is further assisted by an arrangement which enables the Light-vessels to act as Telegraphs, *whereby ship's numbers or casualties may be more readily transferred to the town.*

NOTICE TO MARINERS.

Marine Surveyor's Office, January 9, 1836.

NOTICE IS HEREBY GIVEN,—that on and after the evening of the 20th of this month, the UPPER HOYLAKE LIGHT (which has hitherto thrown a dull *straggling* light to the N.N.W.) will be decidedly and stongly lighted on a *North* aspect, and so masked as suddenly to *appear* when *coming in,* or *disappear* when *going out,* immediately it bears South by compass, thereby indicating *when* BIDSTON and LEASOWE LIGHTS must be *crossed* to clear the 'SIX-FEET FLATS,'

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* S.S.W. 3 miles, 1839.

when *inward* bound, or the 'SPIT-ELBOW OF EAST HOYLE,' when *outward* bound.—*Vide Capt. Denham's Chart of last August.*

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

NOTE.—The above will not interfere with the accustomed operation of the Hoylake Lights off Dove Spit.

NOTICE TO MARINERS.

Marine Surveyor's Office, Liverpool, March 15, 1836.

NOTICE IS HEREBY GIVEN,—that on and after the evening of the 1st of April next, the LOWER HOYLAKE LIGHT will be so lighted as to *open* abruptly when *coming* from the Westward, or *shut* when *going* Westward, directly it bears S. by E.½E. by compass, thereby indicating when you are approaching the line of *N.W. Spit Buoy of East Hoyle,* (H 1 red, with perch,) and that you may haul *into* the HORSE CHANNEL (with Bidston and Leasowe Lights open their breadth Eastward,) when the said Hoylake Light *bursts forth to view:* or haul *from* the Horse Channel to the Westward when it *disappears.* You will thus be guided round the said Spit of Hoyle, (even should the N.W. Light-ship be missing) with the like effect as the Upper Hoylake Light at present indicates when you are to cross the line of Bidston and Leasowe Lights, to clear the Six-feet Flats.—*Vide Advertisement of Jan. 9th last.*

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

NOTICE TO MARINERS.

Marine Surveyor's Office, Liverpool, April 30th, 1836.

In order to distinguish the NORTH-WEST LIGHT SHIP in Liverpool Bay from all other lights in her vicinity, especially when the mariner is approaching in hazy weather, or, at a distance, when her 3 lights so blend in the eye as to appear but one, NOTICE IS HEREBY GIVEN, that on and after the evening of the 1st May next, a BLUE LIGHT, of 2 to 3 minutes' duration, will be exhibited from the said

Light-ship regularly at the following periods, viz: during the months of *November, December, January, and February*, at 6, 8, 10, 12, P.M. 2, 4, and 6 o'clock A.M.; during the months of *March, April, September, and October*, at 8, 10, 12, P.M. 2 and 4 o'clock A.M.; during the months of *May, June, July, and August*, at 10, 12, P.M. and 2 o'clock A.M.

The instant of ignition will be as near Liverpool *mean* time as possible, but those approaching under difference of time at ship, should look out around the anticipated bearing, five minutes before the respective hours.

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

NOTICE TO MARINERS.

Marine Surveyor's Office, Liverpool, Feb. 4th, 1837.

An *additional black Nun-buoy* having been placed in the Rock Channel, upon the *Southern elbow* of the North Spit, NOTICE IS HEREBY GIVEN of the said Buoy, which is intended to guard vessels from the edge of the '*North Spit*,' when *rounding* SPENCER'S BUOY, (next to which it lies, and is marked R 2) or, *turning* through the Narrows Northward of '*Beggar's Patch*,' when the leading marks are obscured to the Eastward.

This additional buoy affords a *closer succession* of buoys along the North side of the Rock Channel than heretofore; and admits the buoy R 3 *(black,)* being removed to abreast of the *Eastern* Narrows of Beggar's Patch; and the buoy R 4 *(black,)* to denote the margin of the North Bank near '*Wrey Gut*.'

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

N.B.—*The black Buoys* R 4, R 5, *and* R 6, *retain their former positions, but are now marked* R 5, R 6, *and* R 7.

PORT OF LIVERPOOL.—NOTICE TO MARINERS.

Dock Office, Liverpool, February 1st, 1838.

(ALL BEARINGS BY COMPASS.)

The Trustees of the Liverpool Docks and Harbour do hereby give

Notice, that the following alterations have been made in the Formby, Leasowe, and Bidston Lights; and the under-mentioned bouys have be moved to suit the alterations in the banks, (as shown in the new edition of the Chart of Liverpool Bay, corrected up to the latter end of 1837, by Capt. Denham).

FORMBY LIGHT*.—This Light is distinguished as a *fixed red light;* and in order to give a clearer berth to the North-western and South-eastern elbows of the banks of the New Channel, which have changed their positions, it is necessary, when *inward bound* from the Westward, to take the bar of that channel with the *red shore light open* a *sail's* breadth to the *Southward* of the *Formby Floating-light,* and after crossing the bar, which the soundings will show, *open them as much to the Northward,* and thus nearing the Floating-light, instead of taking up and preserving those lights in one.

This *alteration* in the character of the *Formby Shore Light* also affords a *distinction* for identifying it when *approaching from the Northward.*

LEASOWE LIGHT.—This Light is so *masked* as to give a defined light in the Rock Channel, within certain limits, and *suddenly disappears bearing S.W.* to vessels *inward bound,* when off *West Wharf Buoy,* R 3, red, and *suddenly appears* when *outward bound.*

BIDSTON LIGHT.—This Light is also *masked* so as to give a defined light in the Rock Channel, within certain limits, and to *vessels inward bound suddenly disappears* on the bearing of S.S.W. when *abreast of East Wharf Buoy,* R 4, *red,* and *suddenly appears* when *outward bound.*

These lines of masking and unmasking intersect that spot in the *Crosby Channel* where the course alters, so that in running up from the Formby Floating-light, the mariner must haul up from S.S.E.¼E. to S. by E.¼E. on *losing* Bidston and Leasowe Lights; and on running down keep away from N. by W.¼W. to N.N.W.¼W. *on their opening out.*

BUOYS.

†These two Buoys bear of each other, North and South, nearly ¼ of a mile apart, the width of the channel entrance.

N 1, Black *(Nun)* N.W. Spit of New Channel.	Moved 3 cables to the S.W. and and bears E.¼S. 1 mile nearly from Bell Beacon, and E.N.E. from N.W. Light-ship 4¼ miles.
N 1, Red *(Can)* S.W. Spit of New Channel.	Moved 3 cables W.¼N. bearing from Bell Beacon E.S.E. one mile, and from N.W. Light-ship E. by N.¼N. 4 miles.

* Superseded by Crosby Light, 1839.

†See Note on following page.—*H. M. D.*

†These Buoys bear from each other, North and South ¼ of a mile apart, and both bear N.¼E. of Leasowe Light-house.	N 2, Black *(Nun)* North side of New Channel.	Moved ¼ of a mile due West, and bears from N 1, *Black*, East ¼ of a mile.
	N 2, Red *(Can)* South side of New Channel.	Moved ¼ of a mile W.¼N. and bears from N 1, *Red*, East ¼ of a mile.
†These Buoys bear North and South of each other, ¼ of a mile apart, and show the width of the channel there.	N 3, Black *(Nun)* N.E. Spit of New Channel.	Moved 1¼ cable N.W. by N. bearing from Formby Light-vessel N.W. by W.¼W. 1 mile nearly, and from N 2, *Black*, East ¾ of a mile.
	N 3, Red *(Can with Perch)* S.E. Spit of New Channel.	Moved ¼ of a mile N.W. bearing from Formby Light-vessel W.¼N. ¾ of a mile, and from N 2, *Red*, East ¾ of a mile.
C 1, Black *(Nun)* on N.W. Spit of Formby Middle Bank, *(Taylor's Buoy.)*		Moved 1 cable N.W. by N. bearing from Formby Light-vessel S.E. by S. 3 cables distant.
R 1, Black *(Can, with Perch)* Spencer's Buoy, at North Spit.		Moved 75 fathoms S.W. of former position, Spit advancing Westward.

NOTE.—A scouring away of the south margin of Little Burbo Bank has taken place, forming a considerable bight between N 2 and 3 *black* buoys; but, as the ebb sets *direct on*, vessels in turning out should *not stand Northward* of the line of those buoys. It should also be borne in mind, that the outer and shoalest edge of the bar (12 feet on low-water springs) has spread nearly half-a-mile farther out, towards Bell Beacon, than in 1835. Vessels are fairly *without* the bar, however, when deepening their soundings 2 fathoms, or half-way between the Bell Beacon and outer buoys N's 1, *red and black*, (Bidston Light bearing S. by E.¼E.;) and they are fairly *within* the bar when deepening their soundings 1 fathom, or half-way between N's 1 and 2 buoys, Bidston bearing S.¼E.

NOTE.—The bearing of the Bell Beacon‡ has been corrected. It now bears from N.W. Light-ship N.E. by E.¼E. 3¼ miles nearly, instead of N.E by E.¼E. 3¾ miles as stated on Chart of 1835.

Bidston and Leasowe throw a *better* light to the Northward since the 11th of November, 1837; thus admitting a cross bearing for picking up the Bell Beacon, and knowing when vessels are *outside* the bar, viz. *either* light bearing S. by E. (Easterly.)

By order of the Dock Committee,

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

†Superseded and arranged according to Capt. Denham's 'New Cut' (Victoria Channel), 1839. ‡Adjusted to the 'New Cut,' 1839, N.E.¼E. 4¼ miles—*H.M.D.*

[NOTICE INTERDICTING LOW-WATER INTERCOURSE, ALLUDED TO IN PAGE 29.]

PORT OF LIVERPOOL.—NOTICE TO MARINERS.

Dock Office, Liverpool, November 14, 1838.

(ALL BEARINGS BY COMPASS.)

The Trustees of the Liverpool Docks and Harbour do hereby give Notice, that in consequence of "TAYLOR'S BANK" advancing to the North-westward, and the "HALF-TIDE SWATCHWAY" having warped its breadth to the Westward, it has been found necessary to move the "FORMBY LIGHT-VESSEL" ¼ of a mile W.¼N. of her former berth, into 25 feet at low water, and likewise to shift the two inner buoys of the Half-tide Swatchway ¼ of a mile N.W.¼N. of their former sites, in 3 feet at low water. Also, the *Fairway* Buoy of that Swatchway, ¼ of a mile W.¼N. of *its* former site, into 9 feet at low water. The fairway course through that Swatchway is therefore preserved, as heretofore, viz: *by bringing the Light-vessel on with the Rock Light,* but upon the bearing of S. by E.¼E. instead of S. by E.¼E.: and the course up "CROSBY CHANNEL," from the Formby Light-vessel, S.S.E.¼E. or, keeping *her* N.N.W.¼W. instead of N.N.W.¼W.

As the Formby Light-vessel still preserves her *original bearing* of W.¼N. from the Formby *Shore* Light*, her application as a leading mark over the bar and through the "NEW CHANNEL" will be the same as at present; but, as the 9-feet spits of that bar have approached each other so as to leave an 11-*feet* passage over it of only 130 fathoms wide, no vessel requiring 11 feet water should, until further notice, attempt the bar *at night* (during spring tides) *after the last-quarter ebb, nor until the first-quarter flood.*

The "NEWCOME KNOWL" having spread Westward, that buoy is likewise adjusted by being moved a ¼ of a mile N.W.¼W. so as to occupy the North-western shoulder of that bank in 15 feet at low water.

The foregoing movements were made on the 13th day of this month (November), according to announcement of the 11th ult.; and that the same may be quite understood, as also to render the Chart of last year as applicable as possible; a lithographed plan of the "New Channel" region, and approaches,† will be issued (gratis) to those whom it may concern, on application to the Marine Surveyor's Office. The plan shows the position of the *New Cut*‡ in progress at the N.W. bight of

*Superseded by Crosby Light, in conformity with my 'New Cut,' 1839.

†As projected by Capt. Denham. ‡*Since designated* Victoria Channel—*H.M.D.*

the New Channel, which all vessels are carefully to avoid, as also not to displace any of the *green* buoys, which denote its limits.

By order of Committee,

H. M. DENHAM,
MARINE SURVEYOR TO THE PORT.

NOTICE TO MARINERS.

NAVIGATION OF THE RIVER DEE.

Trinity-house, London, 30th June, 1836.

This Corporation having caused additional *Buoys*, with a view to facilitate the navigation of vessels passing over Chester Bar and through the Channels, from thence up the River Dee towards Chester, the names, descriptions, and situations of the several buoys, which are now lying in that navigation, are hereunder given for the information of the trade, viz:

N.W. PATCH.

A *Can* Buoy—chequered *black* and *white* with a perch—on the N.W. extreme of the 9-feet Spit of the Middle Patch in 16 feet——with *St. Asaph Cathedral, midway between Rhuddlan Church and Castle,* S.¼W.—*Formby Lighthouse its breadth open northward of the* N.W. *Light-ship—the Light-ship, East—course to Chester Bar,* E. by S.¼S. —*for the inner Channel,* S.E.¼E.

BAR.

A *Nun* Buoy—*Black*—on the N.W. extreme of the West Hoyle (Blaney Patch) in 12 feet.——with *Parkgate Ferry House on the* S.W. *side of the Point of Air Lighthouse—Kirby Church on with the Eye bearing* S.E.¼E. *The* N.W. *Patch Buoy, West—course for the Welch Channel between the West Hoyle and Middle Patch,* S.E.

EARWIG.

A *Nun* Buoy—chequered *black* and *white*—on the South elbow of the Earwig (or Middle Patch) in 9 feet——with *St. Elmos a sail's breadth Eastward of Nante Farm Talacre midway between the Life-boat House and the Captain's House,* S.E. by S. *Bar Buoy,* N.N.W. *Point of Air Buoy,* E. by S.

AIR.

A *Nun* Buoy—*Red*—on the N.E. Elbow of Air Point in 4 fathoms ——with *Mostyn Turnpike House (white) on with the extreme of the Sand Hills, south of the Point of Air,* S.¼W. *Lower Hoylake Light-*

house, on with the northern extreme of Helbre Island, E. by S. *Earwig Buoy,* W. by N.¼N.—*course to the* S.E. *Buoy,* S.E.

S.E. AIR.

A *Nun* Buoy—*Red*—on the S.E. Elbow of Point of Air in 14 feet ——with *Hoylake Church on with the South extreme of Helbre Island, East. The Air Buoy,* N.W.—*course for Mostyn Deep,* S. by E. *or* S.E. by E. *for Salisbury Middle Buoy.*

M 1.

A *Nun* Buoy—*Red*—close to low-water mark of Mostyn Bank at the entrance of the Gut, in 9 feet——with *Hoylake Church, its breadth open North of the Eye,* N.E. by E.¼E. S.E. *Air Buoy,* N. by W.¼W. *a* S.E. *course will lead up the fairway of Mostyn Deep.*

M 2.

A *Nun* Buoy—*Red*—close to low-water mark, on Mostyn Bank, in 12 feet——with *Helbre Point and Eye Isle in one,* N.E.¼N. *The middle Gut Buoy,* N.W.¼N.—*a course* E. by S.¼S. *leads to the entrance of Bug Swash.*

M 2.

A *Nun* Buoy—*Black*—on the S.W. edge of Great Salisbury Bank, in 12 feet——with *Hoylake Hotel, a sail's breadth open south of the Eye,* N.E.¼E. *The mid. Gut 2 Red, North—a* S.E. *course will lead up the fairway towards Bug Swash.*

M 3.

A *Nun* Buoy—chequered *red* and *white,* with a perch on the north extreme of the Spit, (which forms the Fork of Bug Swash and Mostyn Deep) in 4 feet——with *Neston Mills just open South of Parkgate Ferry House,* S.E.¼S.—*Helbre Point, a large sail's breadth open south of the Eye Isle,* N.N.E.¼E.—*a* S.E. by E. *course leads to first buoy in Bug Swash—a* S.S.E.¼E. *course leads up to Bug Buoy* 3.

BUG 1.

A *Nun* Buoy—*Black*—near low-water mark in the bight of the S.W. side of Great Salisbury Bank (forming Bug Swash) in 8 feet——with *Neston Mills in one with Parkgate Ferry House,* S.E.¼S. —*Mather's Smelting Chimney, its breadth open North of Grosvenor's Chimney,* S.S.W.¼W.—*Course* S.¼E. ¾ *of a mile, and then* S.E.¼S ¾ *of a mile leads to Bug Buoy* 2.

BUG 2.

A *Nun* Buoy—*Black*—on the edge of the Great Salisbury Bank,

forming the upper reach of Bug Swash in 9 feet——with *Mather's Chimney, twice its breadth open South of Grosvenor's Chimney,* S.W.¼W. *and the Beach Mark at Helbre open West of the Eye,* N.¼W. *—course to Bug Buoy* 3, S.S.E. ½ *of a mile.*

BUG 3.

A *Nun* Buoy—*Red*—at the East Elbow of Bagillt Bank (forming the West side of Bug Swash) in 6 feet——with *Heswell House in one with Poppet Hall, East, and Neston Mills on with the north end of Parkgate Terrace,* S.E. *Spit Buoy, South.*

SPIT.

A *Nun* Buoy—*Red*—with a Perch—on the south Spit of Great Salisbury in 4 feet (forming the Fork of Flint Deep and Bug Swash) ——with *Neston Church in one with the southern extreme of Parkgate,* S.E.¼E. *and Heswell House on with the north side of Heswell Church,* E.N.E.—*course up the fairway of the Gutter to the elbow,* S. by W.¼W. ¼ *of a mile.*

ELBOW.

A *Nun* Buoy—*Red*—near low-water mark of Bagillt Bank in 2 feet (forming the west side of Flint Deep or Gutter)——with *Gayton House, twice its breadth open southward of Gayton Cottage,* N.E. by E.¼E.—*course to the Flint Buoy,* S.W. by S. ¼ *of a mile.*

FLINT.

A *Can* Buoy—*Black*—at low-water mark of Neston Sands (forming the east side of Flint Deep) in 2 feet——with *Neston Mills, a large sail's breadth open south of Parkgate Terrace,* E.¼S.—*course to abreast of Flint is* S. by W.¼W. 1 mile.

SALISBURY MIDDLE.

A *Can* Buoy—chequered *black* and *white,* with a perch—on the northern extreme of Salisbury Middle Spit, (forming the Fork of Salisbury Gut and Mostyn Deep)——with *Hoylake Church on with the northern extreme of Middle Helbre,* E.¼N. *Point of Air Lighthouse,* W.N.W.—*course for Mostyn Deep, South, and for Salisbury Gut,* S.S.E.¼E.

SALISBURY BANK.

A *Can* Buoy—*Black*—on the West edge of Salisbury Bank in 3 fathoms, (forming the east side of Salisbury Gut)——with *Grange Mill on with the north side of Kirby Church,* E.¼S. *Gayton Hall and Poppet Hall in one,* S.E.¼S. *Salisbury Middle Buoy,* N.W.¼N.—*course to Salisbury Bar Buoy is* S.S.E.¼E.

SALISBURY BAR.

A *Can* Buoy—chequered *black* and *white*—on the southern extreme of Salisbury Bank in 3 feet, and forming the north side of Salisbury Bar——with *Helbre Point a handspike's length open south of the Eye,* N.E.¼N. *Gayton Hall open of Poppet Hall,* S.E.¼S.—*course to Dawpool,* E. by S.¼S.

SALISBURY BAR.

A *Can* Buoy—*Red*—on the N.E. Spur of the Great Salisbury Bank in 6 feet, forming the south side of the Bar——*Gayton Hall, its breadth open north of Poppet Hall,* S.E.¼S. *Helbre Telegraph,* N.—*course from one cable's length* N.E. *of this Buoy to the fairway of Dawpool,* S.E.

CAWDY.

A *Can* Buoy—*Black*—on the S.W. extreme of Cawdy Blacks in Dawpool Deep in 6 feet——with *the Beach Mark of Helbre on with the east side of the Eye Isle,* N.¼W. *Kirby Church in one with a remarkable White House at the foot of Grange Hill,* N.N.E.¼E.—*course to abreast Great Salisbury Buoy is* S. by E.¼E.; *to the Deeps (if bound into Parkgate)* S.E. *southerly. Subject to tide in both cases.*

DEEPS.

A *Can* Buoy—chequered *black* and *white*—on the northern extreme of the Spit of Parkgate Sands, which forms the Fork of Flint and Parkgate Deeps——with *Neston Mill, its breadth open east of Gayton Cottage,* S.S.E. *The north part of Helbre Isle just open west of the Eye Isle,* N. by W.¼W.—*course to Flint Deep,* S.¼E. *For Parkgate Deep,* S. by E.¼E.

GREAT SALISBURY.

A *Can* Buoy—*Red*—at the eastern elbow of the Great Salisbury Bank in 6 feet—on the west side of Flint Deep——with *Neston Church, its breadth open west of Parkgate Ferry House,* S.S.E.¼E. —*the house on Helbre Isle shut in by the west side of Middle Isle,* N. by W.¼W.—*course from this up the fairway of Flint Deep is* S. by W.¼W. *till abreast of Flint Deeps Buoy.*

FLINT DEEPS.

A *Can* Buoy—chequered *red* and *white*—on the S.E. elbow of the Great Salisbury—on the west side of Flint Deep in 4 feet——with *Beach and Eye Marks of Helbre in one,* N.¼W. *Heswell House a handspike's length, open north of Heswell Church,* E. by N.—*course* S.W. *to keep the fairway of Flint Deep till at the Red Spit Buoy.*

SELDOM SEEN.

A *Nun* Buoy—*Black*—on the west elbow of the Lime Wharf, forming the eastern side of Dawpool Deep——with *Hoylake Church and the Eye Isle in one*, N.E. by E.¼E. *Grange Mill on with the north side of Kirby Church*, E.¼S.—*course to the Deeps Buoy*, S.E.

N.B.—The whole of the before-mentioned Buoys are marked as they are herein denominated; the depths of water are those of low-water spring tides, and the bearings are magnetic.

By order,

J. HERBERT, SECRETARY.

NOTICE TO MARINERS.

NAVIGATION OF THE RIVER DEE.

Trinity House, London, 29th March, 1838.

NOTICE IS HEREBY GIVEN,—That two additional *Buoys*, marked as hereunder mentioned, have been placed in the *River Dee*, in the following situations, viz:

A Red Can Buoy, marked "*Welchman's Gut*," on the West Spit of the West Hoyle Sand, in 5 feet at low-water spring tides, and with the following compass bearings, viz:

Mostyn Gut Buoy.....S.W. by S.¼S.
Salisbury Middle Buoy .....W.¼S.
Salisbury Swatchway Buoy .....S.W. by S.
Point of Air Lighthouse .....W. by N.
Helbre Telegraph .....E. by N.¼N.

A Black Nun Buoy, marked "*Salisbury Swatchway*," in 12 feet at low-water spring tides, on the West Spit of the Great Salisbury Bank, at the entrance of the Swatchway, and with—

Mostyn Gut Buoy, bearing .....S. by W.¼W.
Welchman's Gut Buoy.....N.E. by N.
Helbre Telegraph .....N.E.¼E.
Point of Air Lighthouse .....N.W.

By order,

J. HERBERT, SECRETARY.

NOTICE TO MARINERS.—MENAI LIGHTHOUSE.

Trinity House, London, 14th June, 1838.

NOTICE IS HEREBY GIVEN,—That, in fulfilment of the intention

expressed in the Notice from this House, bearing date the 6th April last, the light at the North-eastern Entrance of the *Menai Straits*, will be exhibited, for the first time, on the Evening of Thursday, the 28th instant, and thenceforth continued every night from Sun-set to Sun-rise.

Mariners are to observe, that the Light in this Tower will be *stationary*, and of a *Red* colour, visible from N.W.¼W. seaward, to S.W.¼W. excepting that, by the intervention of *Puffin Island*, the light will be eclipsed to vessels upon the bearings from it of E. by N.½N. to E.½S.

N.B.—Masters of vessels and others are hereby cautioned not to approach the Lighthouse within the distance of 50 yards, on account of a Ledge of Rocks which extends under water from the base of the building.

By order,

J. HERBERT, SECRETARY.

REMARKS

AND

SAILING DIRECTIONS

FOR APPROACHING AND NAVIGATING

THE SEA-REACH OF WYRE

UP TO

PORT FLEETWOOD,

WITH SOME ACCOUNT OF

WYRE LIGHTHOUSES & ESTUARY.

BY

COMMANDER H. M. DENHAM, R.N. F.R.S.

CONSULTING MARINE SURVEYOR.

1840.

Liverpool,

PRINTED AND PUBLISHED BY J. AND J. MAWDSLEY, CASTLE-STREET.

Custom-house, London, 16th January, 1840.

NOTICE IS HEREBY GIVEN,

That the Commissioners of Her Majesty's Customs have, in pursuance of the powers vested in them by the Act of the 3rd and 4th Wm. IV, chap. 52, sec. 135, appointed the

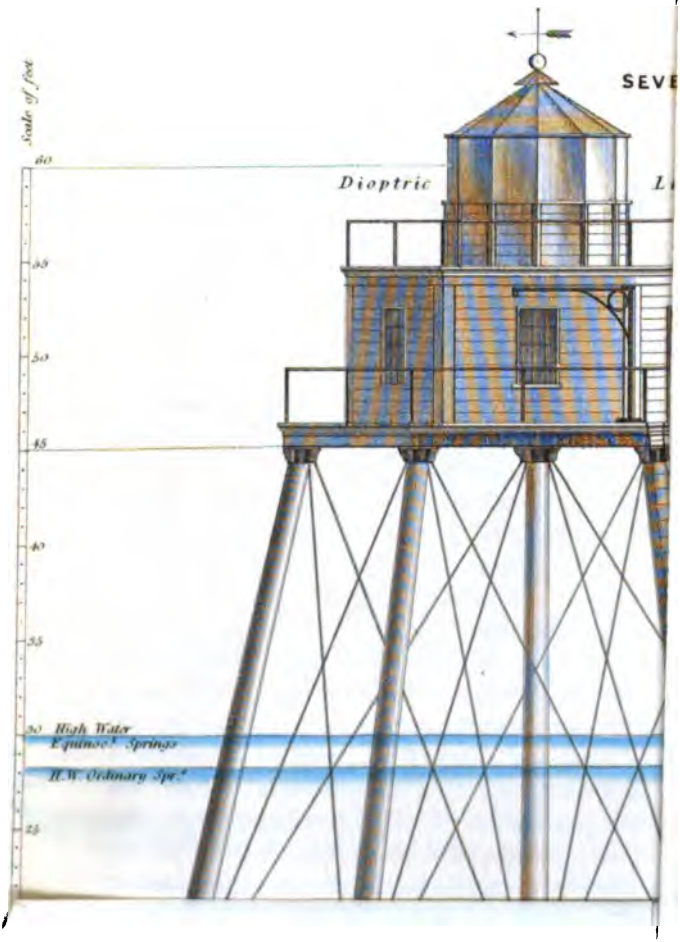
HARBOUR OF FLEETWOOD,

NEAR LANCASTER,

to be the proper station for all Vessels coming to, or departing from, the Port of Fleetwood, to bring to, for the boarding or landing of Officers of Customs; and that the Master of any such Vessel, who shall fail to comply with the provisions of the said Act, will render himself liable to a penalty of One Hundred Pounds.

By order of the Commissioners,

(Signed) G. A. SCOVELL, Secretary.


SEVE
Dioptric
Scale of feet
60
55
50
45
40
35
30
25
High Water
Equinoc.l Springs
H.W. Ordinary Spr.s

DESCRIPTION AND STRUCTURE

OF THE

WYRE (SEAWARD) LIGHTHOUSE,

LEADING TO

PORT FLEETWOOD.

IT was my study when planning this navigation to identify the remotest spit of bank turning into it, without subjecting the mariner to the treacherous, and, at best, but partially-lighting agent, a *Light Vessel;* Messrs. Alexander Mitchell and Son, of Belfast, readily took up the proposition, and the Board of Directors of the railway and harbour project, as readily adopted the application of Mitchell's ingenious mooring screw to the insertion and basing of piles or pillars, in sub-marine foundation. I had given much trouble to Messrs. Mitchell, when unavailingly submitting their plans and specifications to the Liverpool Dock Committee, (Oct. 4, 1838,) of so perfect a mode of establishing lights *out upon the very* banks of a navigation, whereby the power and object of a lighthouse is enhanced by proximity with the anxious observer from sea. In fact, a lighthouse can be thus erected upon any *under-water* spit, as indifferent to a 30-feet rise of tide and channel surge, whilst sending forth its light of the same character and stability, as if on the main land; thereby throwing it more intensely and effectively *on the region required,* especially where shoals out-lie the main to any extent. Its time in erection, the shortest possible,* and of so portable a structure that it may be removed, if local changes require, to another site in a month. Wherefore, then, should not every spit, now guarded by a light-vessel, with her unavoidably inferior order of lights, rendered more so in a gale of wind by pitching, floundering about, and ever and anon submersed in the trough of sea, spray, and spoon-drift, and

*The Wyre Lighthouse was reared in two of the shortest-day months in the year, not affording *daylight* during a low-water period, spring tides, but depending on flambeaus or moonlight.

that too when most wanted, and often at the very crisis of exigency to all around, *breaking adrift?* Wherefore not supersede them by so purpose-like a fabric? Let those who take interest, but who doubt or cannot conceive the matter, go to Fleetwood-mount Observatory, commanding the mouth of Wyre, and watch the effects of a westerly gale upon the first of its kind, (not associating the effects of a sea-way upon the Eddystone or Bell Rock, for the screw-piled pillars *do not oppose* the sea). A structure destined to save many a gallant bark that would otherwise drive, unbeaconed and unwarned, upon the sands of Morecambe Bay, and I doubt not will give rise to a general adoption; whilst rendering it imperative on local guardians of a navigation, to establish REFUGES for the cast-away mariner, on the isolated banks; since, by this method, the practicability is manifested. Indeed, this sub-marine method of commanding foundation and *hold-fast*, so ingeniously contrived by Messrs. Mitchell, combines the vital essentials to the seaman's hope, of *warning, guiding, succouring*, and, when in port, *securing!* The figure of this first '*Screw-pile*' Lighthouse in the United Kingdom,—in the world I may say,—is shown on the annexed chart, and presents to the eye a well-proportioned group of columns rising out of the sea, in the intervening and over-lapping order that hexagonal or six-angled figures produce, according to the separate angles you may be opposite to; a systematic interlacing of tension-rods renders the fabric sufficiently opaque, even below the platform; but above the platform, of 27 feet diameter, you have a six-angled dwelling-house of 20 feet diameter, by 9 feet high; on the centre of which rises the 12-sided lantern, with Chinese roof, of 10 feet diameter. Thus, you have a figure of 46-feet spread at the base, contracting at the platform balcony to 27 feet, and elevated 45 above low-water level; surmounted, as stated, by a bulky, yet pleasing and effective, superstructure, comprising a comfortable residence for the light-keepers, whilst affording you a steady, bright, *uniform* light, 45 feet above mean-sea level,—ranging over an eight-mile horizon, visible 10 miles from a coaster's deck, and freed from those *breaks* of brilliancy attending the offing passage from reflector to reflector, by being fitted with a light of '*Dioptric*' order. Foggy periods are provided for by a self-acting deep-sounding bell, tolling three strokes of five-second intervals, at one minute pauses; and tide-time for vessels of 12-feet draft, is denoted by 2 black balls being kept upon its flag-staff until 12 feet ceases upon

the *straight course, right up;* at the same time, however, denoting 17 feet up through the *buoyed* channel; and vessels requiring a Wyre pilot will be understood at this lighthouse if showing a weft at the peak, besides their pilot-jack at the mast-head; whence, a pilot-jack will *also* be hoisted until she is provided. The Wyre Pilot-boats are of sloop and yawl rig, with black bottom, *white* top-sides and black streak, with her number and the letter F on the mainsail. Their cruising ground extends from Formby Point to Havering Point of Duddan. The Sub-commissioners hold their board at Fleetwood, and are officially appointed in the following order:—

CAPTAIN DENHAM, R.N. F.R.S.
SIR P. HESKETH FLEETWOOD, Bart. M.P.
STEPHEN BURRIDGE, Esq. Collector of Customs.
FREDERICK KEMP, Esq. of Bispham-lodge.

SPECIFICATION *of the above* SCREW-PILE LIGHTHOUSE,

erected on the north-eastern low-water spit of North Wharf Bank, at the entrance of the Wyre Navigation, the structure being supported upon, and secured to, the bank with Mitchell's Patent Screw Piles, of 3 *feet diameter.*

THE foundation of the building is formed of seven screw piles, six of which are the angles of a hexagon, about 46 feet in diameter, and the seventh pile stands in the centre of the figure.

The heads of all the outer piles have an inclination inwards, by which the diameter of the frame-work connecting the top of the columns, and upon which the house stands, is contracted to about 27 feet. Each screw pile is formed of a malleable iron shaft 15 feet long and 5 inches diameter.

On each pile a 3-foot screw is firmly keyed near its lower extremity, beneath which is placed a large drill or opening bit.

At the upper end of the shaft is a screw of 18 inches long and 2 inches diameter, for drawing down and screwing the wooden column to the iron pile, which latter stands about 5 feet out of the ground.

The columns are thus prepared;—seven logs of Baltic timber are selected, of the largest and best quality; the centre one is 56 feet in length, all the others are 46 feet.

The pedestals rise about a third of their height, and the remainder of

the shafts are rounded, both for appearance and as lessening any vibration from the action of the sea.

An opening in the lower end of each column is then made of 5 inches diameter, and to the depth of about 8 feet, by boring in the manner of a water-pipe; strong iron hoops are then driven upon it, hot, the first about 8 feet up, the second about 4 feet, and the third at its lower extremity.

This hooping will give to the column greater strength than it originally possessed, especially as the wood removed by boring is the weakest in the tree, and adds scarcely anything to its actual strength.

The column being raised perpendicularly above the iron pile, the end of the latter is introduced into the opening prepared for it, and which has been made to fit accurately upon it; when the top of the pile has reached the end of the cavity, screwing on (by capstan), the foot of the column will be inserted in the bank about 3 feet; the wood, when wet, will clasp firmly on the iron, but, as an additional security, the internal screw attaches the two together.

The framing upon which the house stands is firmly secured round the centre column and to the heads of the outer ones, by means of cast-iron capitals let down over the heads of the columns, the capitals being cast hollow for the purpose; to the abacus of these the top framing is secured with screw bolts passing down through the wood and iron, having nuts on the under side, all boring or cutting into the main support of the building being thus avoided, and the adjacent parts of the framing are bound together by wrought-iron straps and knees; the beams which radiate from the centre to the heads of the outer columns are 12 inches deep by 7 inches wide, and those which connect the heads of the outer columns, 12 inches by 4.

To give lateral strength to the building to resist the effect of heavy bodies drifting against it, twenty-four angle braces from round iron of 1¼ inch diameter are applied, as shown in the plan, by which a resisting power equal, at least, to 350 tons, is presented in every direction; these braces are secured at the top to trusses cast with the capitals, and beneath to strong wrought-iron bands with projecting bolt holes; by these means boring into the columns is again avoided, the braces are keyed up at their crossing, as shown in the plan.

The light-keepers' house, which is hexagonal, is in diameter from angle to angle 22 feet, and 9 feet in height.

The centre column rises to the base of the lantern, which, with the roof, it assists to support, giving great additional stability to the whole structure.

The corner-posts of house are 7 inches by 6, all remaining studs 6 inches by 4, beams of roof 9 inches by 5, and all outside planking, together with floor and roof of house, is 2 inches thick.

The house has an outside door and three windows, and is divided into two apartments, one having a fire-place and the floor tiled; the walls and ceiling of both apartments are lathed and stuccoed.

The lantern, which is 12 sided, is 10 feet in diameter, and in height to the top of the windows 8 feet, by which the lights are raised above the highest spring-tide level about 31 feet, or 44½ above half-tide level.

The lights (in this case of dioptric order) show throughout the periphery, and the roof is covered with strong sheet iron; (a lightening repeller and conductor, of course).

The light-keepers' house is covered with sheet lead, and a light iron railing is carried round the top of the building and the platform on which it stands.

Access to the latter is effected by a Jacob's ladder of wrought iron, secured to one of the columns and to the lantern by a winding stair within the house.

HENRY MANGLES DENHAM.

60, *Pall Mall, London,*
Jan. 31, 1840.

SAILING DIRECTIONS

FOR APPROACHING

THE FOOT OF WYRE,

AND THENCE UP TO

PORT FLEETWOOD.

All bearings and courses imply *by Compass.*
All distances given are in *Nautic Miles.*

HAPPILY for the mariner, and those embarked in this NEW-PORT enterprise, few directions will be necessary to enable even a stranger to enter it. The *local* mariner sums it up in a proverb, "as easy and safe as Wyre water." The Lighthouse at the entrance, or as it is locally called, 'Foot of Wyre,' exhibits* a fixed bright light, and stands upon the north-eastern elbow of 'North Wharf,' forming the western side of the entrance, situated altogether near the western extremity of the *south* arm of Lancaster Bay, 30 miles northward of Liverpool, and directly opposite the well-known bright revolving light† of WALNEY ISLAND, which forms the termination of the *northern* arm of that bay, bearing S. by E.¼E. and N. by W.¼W. of each other—distant 8 miles. This *Wyre Lighthouse* described, is situated in latitude 53° 57' 8" N. longitude 3° 1' 10" W. and

Relative position on the Coast.

Relative position of Walney and Wyre Light-houses.

* *i. e.* intended to be lighted in March, 1840, of which notice will be given.

† Walney Lighthouse stands upon the south extreme of Walney Island, presenting a tall thin-looking greyish tower; its lantern 84 feet above half-tide level; built 1790; and lies in latitude 54° 2' 56" N. longitude 3° 10' 32" W. ranging over 11 miles horizon, and showing a bright revolving light for one minute at five-minute intervals.

Walney Light-house.

lies upon a clearing course from the following positions of departure:—from

Leading courses and distances to Wyre Light-house.

Skerries Lighthouse	E.¼N. (Skirting North Wharf.)	65 miles.
Kingstown, Dublin	E.¼S.	118 „
Drogheda	E. by S.¼S.	117 „
Carlingford	S.E. by E.¼E.	110 „
Calf of Man Lights	S.E. by E.¼E.	65 „
Douglas-head Light, Isle of Man.	S.E.¼E.	52 „
Maughold-head, Ramsay, Isle of Man	S.E.¼S.	50 „
Ulverstone (up Furnace Channel).	N.N.E.	14 „

But if making for Wyre from any point southward of the Skerries, or northward of Ramsay, Walney Light should first be sought;—it bears from

Positions whence Walney should be first sought.

Point Lynas, Anglesea	E. by N.¼N.	56 miles.
Menai Light	N.E. by E.¼E.	55 „
Great Ormshead	N.E. by E.	49 „
Western limits of N.W. Light-ship's Lights	N.E.¼E.	40 „
The N.W. Light-ship, Liverpool Bay	N.E. by N.	36 „
Bell Beacon, (New Channel) Liverpool	N.E. by N.	32 „
N.W. Buoy of Formby	N.N.E.¼E.	29 „

It will appear, on reference to the *clearing* courses leading from the Irish Sea to the *Foot of Wyre*, that a *fairway* space is open for 45 degrees of the western horizon, or 4 points of the compass, so that you may *steer* for 'Wyre Light' when between the bearings of E.¼S. and S.E.¼S. The separate bearings given of Walney Light tells you to consider *it* as your guide into the *fairway range* of Wyre Light, under those pressing circumstances anticipated in the Liverpool Sailing Directions, at page 35. The

Case of seeking Wyre as a Refuge referred to.

old-established light of Walney (1790), *revolving*, and the recent light of Wyre (1840), being a *fixed* light, though both of the natural colour, present a distinction that places mistake or doubts beyond possibility. These two lights not only mark the two horns of Lancaster Bay, but check the distance you may be from one or the other; for instance, when reaching towards Walney upon the bearing of N.E. by N. which is the fairway from the southward for taking 'Piel-a-Foudre,' Wyre Light brought on the respective cross-bearings of

How Walney and Wyre Lights afford you cross-bearings.

	indicates you are	Miles.		Fathoms.	
East		9	off Walney, in	12	—sand.
E. by S....		7	(in Lune Deep)	25	—muddy bottom, but water clear.
E.S.E. ...		6	off Walney, in	6	—sand—water murky.
S.E. by S.		4½	„ „	6	— „
S.E.		3½	„ „	5	— „
S.E. by S.		2½	„ „	3	— „

To know how far you are off Walney.

Likewise, when approaching the Wyre Light upon the fairway course of E.¾S. for Foot of Wyre, skirting ¾ of a mile off North Wharf, WALNEY Light, on the respective cross-bearings of

	indicates you are	Miles.		Fathoms.	
N.E.by E.		11	from Wyre, in	15	—sand.
N.E.		8½	„ „	13	— „
N.E.by N.		7	(in Lune Deep)	25	—muddy bottom, but water clear.
N.N.E. ...		5½	from Wyre, in	13	—water murky.
N. by E...		4	„ „	13	— „
North ...		2½	„ „	12	— „
N.by W...		1	„ „	10	— „

To know how far you are off Wyre.

Such are the double cross-checks and indications of safety in the mariner's *night* approach; so that LOOK-OUT is the only order to be enjoined,—LEAD and *look-out*, the *proper* seaman's stand-by, being reserved for *thick* weather. For *day-light* approach,

A good Look-out and faithful Compass.

however, in *clear* weather, we have to acquaint him with certain bold contiguous inland feature, to assist picking up either of the horns of this bay, for they are flat and low. The first land-fall in the vicinity of Lancaster Bay, on your approach from the westward, is that shoulder of the Cumberland hills, known as *Black Combe*, which slopes to the sea 13 miles N.¼E. of Walney Lighthouse; therefore, supposing you rising it in clear weather from the Skerries or Point Lynas, (a possible distance of 50 miles, and 26 fathoms water,) you will be induced to keep a look-out 1½ point on your starboard bow, or steer E. by N.½N. to pick up Walney Lighthouse; if, however, you are from the southward, Black Combe should be brought N. by E.½E. which not only leads the *eye* over the western projection of Walney Island, but ensures your being 2 miles outside the oyster grounds and Ribble Flats; if thick weather comes on, never shoal your water below 8 fathoms—mud on your lead says *safe water*. In the northern aspect, always look for Walney, one, two, and three points westward of Black Combe, according as you bring it aft; thus introducing Walney Lighthouse as the finger-post for Foot of Wyre Lighthouse; I will not charge your mind with any remote leading bearings; it is sufficient that you comprehend the simple fact of the north-western angle of the main land of Wyre, called 'Rossall Point,' lying 9 miles S.½E. of Walney, which is a low flat projection, trending 12 miles northward from the Ribble, and then 1⅝ mile east for the high-water mouth of Wyre (Port Fleet-

The Coast *low*, but identity assisted by *Black Combe* in day approach.

From the Westward.

From the Southward.

From the Northward.

Rossall Point.

wood), distinguished by its town, lighthouses, and summer-house, with signal-mast on 'Mount Fleetwood'; that Rossall Point is distinguished of old by a bulky sugar-loaf beacon, [see sketch on Chart, and coast view, embracing all,] off which three-fathom shallows extend westward, and North Wharf, a half-tide bank, 1½ mile northward. A red can-buoy (marked King's Scar) guards the bank 2 miles north of the land-mark, and 1½ mile west of Wyre Lighthouse; but if thick weather, you can *feel* your way, for the true seaman's faith in the LEAD is here promoted by distinction of depth and bottom: so should it happen that you fall in with land bearing *easterly*, Walney presents 8 fathoms 3 miles off, and Rossall but 4 fathoms, murky water; and if by standing *south* for 3 miles you deepen to 25 and 28 fathoms (clear water, but muddy bottom), then you have got into *Lune Deep from* off *Walney;* or if that depth is obtained in 3 miles' run *north,* then you were off *Rossall*, and being now in Lune Deep, have only to steer E. by S. for Foot of Wyre Lighthouse.

Port Fleetwood appearance.

Rossall Mark.

King's Scar.

Indications by sounding in thick weather.

Once in LUNE DEEP, your course is clear.

In clear weather, however, all these considerations, and putting this and that together, as the old tars phrase it, are *at an end.* You have seen *Black Combe*—that's enough; you bring it N.N.E. and ranging your eye away east, you observe the high castle, church, and elevated town buildings of Lancaster, flanked by high land, but well in the fore ground; and southward of that range of hills, you perceive a dark rising covered with trees, with a wind-mill exposed at the southern fall of those trees.

Coast feature and objects that lead the eye to Foot of Wyre.

Preesall. This rising (remarkably contrasting the surrounding coast feature) is called *Preesall:* bring Preesall on the bearing of S.S.E.½E. and as it lies 3 miles on that bearing from Wyre Lighthouse, your eye will soon catch the *sea*-beacon lighthouse, *groving*, as it were, out of the water, as already described.

Consult the TIDE-TABLE. This done, you will have time to consult the folowing tide-table and your watch, as to whether, in reference to the time of tide and your draft, you should run on or give a little time. You are to understand that the flood stream sets direct for this bay from the westward, producing high water 15 minutes later than at Liverpool Docks or Isle of

Tidal particulars. Man; it is, in fact, high water upon full and change ☽ 20 minutes past 11 o'clock; Equinoctial springs rising 29½ feet; Ordinary springs 27 feet, and Neaps 21 feet, the half-tide level being 14 feet 9 inches; average velocity, 3 knots upon flood, and 3½ upon ebb tide. I take, for example, that you have arrived within 3 miles of Wyre Lighthouse at 8 o'clock, a.m. on the 7th of January, 1840—your vessel draws 9 feet water—can you proceed? being high water at Wyre 1h. 0m. p.m.

Application of Table by example. *Example* 1*st*.—Opposite 1h. and under 1 hour flood, in annexed Tide-table is..... 5 feet.
The least water on the course up Wyre by the buoys at low-water springs..... 5 „

10 feet.

You may therefore proceed, there being 10 feet.
But perhaps you require 16 feet; how long must you heave to, according to present stage of

improvements, in the channel up to Fleetwood for the 16 feet?

Example 2nd.—Opposite to 1h. and under 2½ hours' flood, is.....11 feet. Example 2nd.
The least water at low-water springs is .... 5 „

16 feet.

You can therefore proceed at half-past 9 o'clock; and so you may answer your own question by reference, under every variety of case, to the following Table:—

A TIDE TABLE, *adapted to show the half-hourly rise and fall of Tide at the entrance of the* WYRE, *it being only required to know the time of high water on any given day which the* Manx *or* Liverpool *Tide-Table gives, by adding* 15 *minutes time.*

When it is High Water at or near *either of the following times.*	*There will be at each half-hour* before *or* after *the respective High-water periods as hereunder expressed:*												
	H. W.	Last ¼ hour's Flood, or first ¼ hour's Ebb.	Five hours' Flood, or 1 hour's Ebb.	¾ Flood, or ¾ Ebb.	Four hours' Flood, or 2 hours' Ebb.	3¼ hours' Flood, or 2¼ hours' Ebb.	Half Tide.	2¼ hours' Flood, or 3¼ hours' Ebb.	Two hours' Flood, or 4 hours' Ebb.	¾ Flood, or ¾ Ebb.	One hour's Flood, or 5 hours' Ebb.	First ¼ hour's Flood, or last ¼ hour's Ebb.	L. W.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
XII o'Clock	27	26	24	22	19	16	14	10	9	6	4	3	2
XI or I „	26	25	24	22	19	16	14	11	9	6	5	4	3
X or II „	24	23	22	21	18	16	14	11	9	7	6	5	4
IX or III „	23	22	21	20	18	15	14	12	10	8	7	6	5
VIII or IV „	22	21	20	19	17	15	14	12	10	9	8	7	6
VII or V „	22	20	19	18	17	15	14	12	11	10	9	8	7
VI „	20	19	18	17	16	15	14	13	12	11	10	9	8

Note.—At Equinoctial seasons the Tide will exceed the rise and fall shown in the above Columns, by *two feet*, Westerly gales accelerating, and Easterly gales retarding the *Flow* about ¼ of an hour: events, which affect the *Soundings* in like proportion.

Rise of Tides above Equinoctial Low-water level at the Wyre.

- Equinoctial Springs ..... 29½ feet
- Ordinary ..... 27 „
- Neaps ..... 21 „

} High-water at Full and Change, ☽ XIh. 20m.

LOW-WATER FEATURE
OF THE
ENTRANCE AND SEA-REACH OF WYRE,
WITH DIRECTIONS TO PROCEED UP TO
PORT FLEETWOOD ANCHORAGE.

THE junction of Wyre water with the sea is locally called *Foot of Wyre;* it lies 1⅝ mile due north from the nearest main, a flat projection of land, where the town of Fleetwood is forming, and known as the Warren; the western side of this Foot of Wyre and sea-reach from the main, is bounded by *North Wharf,* an outlay of sand with patches of skear* and gnarr.† The eastern margin is formed by a similar extent, but clearer surface of sand, which connects with the main on the eastern side of the river, along Knott-end shore, and is called *Bernard's Wharf.* The width of the entrance from sand to sand is 600 yards, with as much as 2 fathoms at low-water ordinary spring tides. The boundary sands turn short east and west from the entrance; the North Wharf carrying 14 fathoms, and Bernard's Wharf 10 fathoms, a ¼ of a mile off. Bernard's Wharf trends E. by S. for Sunderland Point and Lancaster, and does not cover until half-flood: North Wharf trends with a gentle curve outwards, west 1½ mile, the centre part not covering until half-flood; abruptly turning southward for

Foot of Wyre.

Nature of Shore.

North Wharf.

Bernard's Wharf.

Width and soundings about entrance.

* Skear, or scar, means patches of mud or marl, covered with rolling stones of various sizes.

† Gnarr is honey-combed clusters of hardened sand, to which sea-weed clings, looking like rocks, but easily crushed.

Rossall Land-mark; but three-fathom flats extend 3 miles further westward, generally denominated 'Oyster Ground,' but locally called Shell Wharf. The light at Foot of Wyre preparing for March, 1840, (a plain bright light,) brought at all southward of east, clears the ground, and E. by S.½S. as you advance within ½ a mile of the light, clears the curve of North Wharf right up to a clearing-berth off the lighthouse, which clearing-berth is indicated in *day-light* by a *red* nun-buoy, lying 2 cables due north of the lighthouse. That buoy (like all red buoys in this navigation, must be left on your *starboard* hand *going in)* may be passed close to on its northern and eastern side; looking then due north, you will descry two lighthouse columns* upon the main, rising above the surrounding town buildings; the *farthest* and southernmost is three times the height of the nearest. Bring them in line, (bearing SOUTH,) and in 10 minutes' run, (supposing it flood-tide,) or when you have made 1¾ mile over the ground, you will be within a cable's length of the main land, 'Steep Breast'; hard a starboard, keeping with line of Fleetwood shore a ship's breadth off, until in ¼ of a mile; thus running, you will find yourself amongst the *mooring buoys:* let go your anchor in the clearest berth, you will then be in the natural basin anchorage of 21 feet at low-water springs, *without any tide,* if before half-tide; send your hawser to the nearest mooring buoy; trip your

Oyster Ground.

How Wyre Light clears you.

The Shore Lights.

The *one* bearing-line right up.

When to haul for Anchorage.

Mooring Buoys, and 21 feet at Low-water.

* If after July, 1840! when *a* Ball being hoisted in day-light on the outer Lighthouse of the two, as well as Foot of Wyre; *two* Balls at each Lighthouse indicating 12 feet water right up. The inner Lights only lighted *whilst* 9 feet water is afforded right up.

anchor, (no fear of its hooking mooring chains, for they are of Mitchell's patent screw, and therefore grow *up and down* to the buoy,) pass the end of your bower cable to the buoy, *shackle it to the ring of it*, or reeve it, and bring the end in at the other hawse ready for slipping, if likely to go out again on the same tide. This anchorage is called 'Canshe Hole,' sheltered from sea upon every point of the compass, at one cable distance from the Custom-house Wharf on the western side, and half a cable from the Canshe Bank on the eastern; no tide from half-ebb to half-flood, but a three-knot stream from half-flood to half-ebb, the flood setting S. by E. and ebb N.N.W.

Mitchell's Moorings; no fear of hooking your Anchor.

Reeve your Hawser to Buoy, if off same tide.

Canshe Hole tidal capacity.

If a steamer, with live stock, you will have water alongside a landing-wharf connected with the railway* to Preston.—Now then,

TO RUN UP THE SEA-REACH OF WYRE INTO PORT FLEETWOOD ANCHORAGE, BY NIGHT.

HAVING made the Foot of Wyre Lighthouse, let your nearing it be guided by tide time, and judge your distance in passing northward of it, by the *lead* not shoaling your water below 3 fathoms; keep a bright eye to the southward, and if on bringing Wyre Light a-beam, two steady lights, in *upper* and *lower* order, open upon you, and your draft does not exceed 9 feet, (until further notice of improvement,) haul south, and keep the two lights *one over the other* until you perceive they

Soundings give you distance.

Lights lead you.

* Preparing for July, 1840.

Lights speak to you.

come on the same *level*, and join as *one* light,* (your lead will at the same time give you a hint

When to Anchor.

by deepening 2 fathoms); then hard a-starboard, skirting the town shore on your starboard hand, until the light from the *inner* lighthouse disappears, or the town lights bear west of you, or you see a mooring buoy, when *down anchor.*

TO RUN UP WYRE SEA-REACH TO THE ANCHORAGE,

(At the earliest time of Tide,)

BY DAY—PERHAPS FOGGY.†

If under *steam*, or a free wind, (which any wind is if not southward of W.S.W. or E.S.E.) you will carry 14 feet up to Fleetwood at low-water neaps,

To gain 5 feet water by taking Buoyed Channel.

and 10 feet at one hour's flood upon springs. By taking the river's course as marked by 3 red buoys and a perch (two-thirds up) on the starboard or western hand, and 1 chequered buoy and 3 black buoys on the larboard or eastern hand.

How to round Foot of Wyre.

First, give the Foot of Wyre Lighthouse its berth shown by the outer red *buoy;* haul southward *short* round it; coax her up S. by W.; the perch on east elbow of Black Skear, and the diamond-topped mark near the town will be in one (bearing south), the black and white chequered buoy half a cable *westward;* and as you approach the red buoy,‡ keep away S.E. until it draws on your *starboard* quarter;

Application of the Beacons.

haul up south again, keeping the two beacons open

* As shown in annexed diagram.

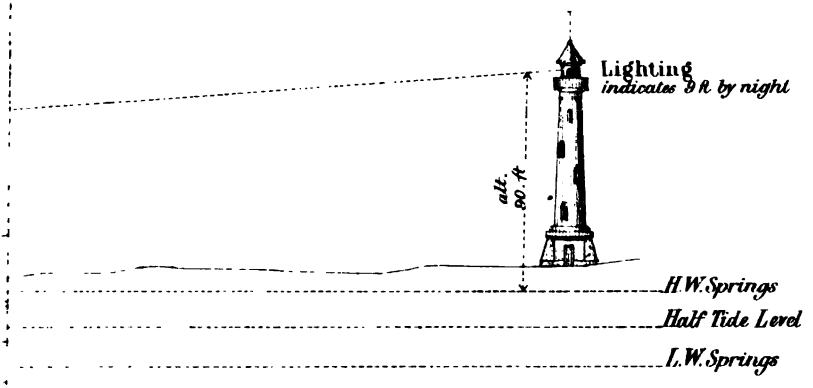
† It is but rarely here that fog obscures the leading objects from this short reach.

‡ Lying on the north end of Great Ford, and the first you have seen since rounding the Lighthouse.

Rooms.

5 10 10 Feet

Scale to Plan of Lightrooms



their apparent length eastward, or the two light-houses in one, or giving the 2 first black buoys half a cable berth on your larboard (eastern hand), until *close* abreast of the oblong-topped perch (guarding the Black Skear) on your starboard hand; pass equally close to the *red* buoy, just above, opening the lighthouses WESTWARD. A *black buoy* guards the spit of *Knott*, forming the western elbow of the reach; give it a berth of half a cable on your larboard hand; haul south-eastward, skirting the main shore of Fleetwood as before; stand by your anchor, which you may save *letting go* if smart in shortening sail, dropping your craft towards one of the *mooring* buoys.

Rounding Knott.

Hook a *Mooring* Buoy, and save Anchorage.

Thus, upon *one course*, and that not depending upon compass, but a *line of lights*, you have been conducted from 20 fathoms broad water to a land-locked anchorage; and even when availing of the buoyed deeps by day, the $1\frac{3}{4}$ mile run has been accomplished without slacking tack or sheet, or pulling in a brace, so momentary and trifling are the changes of course, the whole, in fact, is done in 10 minutes run, and in *smooth water;* whilst should you, under scanty wind, break off by splitting canvas, or carrying away a spar, instant anchorage* offers—steam-tug assistance† is within a mile—or, if driving to leeward by snubbing the cable too soon, marl and sand receive you, without any surf that can endanger cargo, let alone life. What more

The simplicity of operation reverted to.

STEAM-TUG assistance.

The risks of far-extending dangers averted.

* 15 feet water at low-water springs is afforded abreast of the Perch.

† A Weft at the lee Fore or Main Topsail Yard-arm, will receive Steam-tug assistance under any circumstances.

need be adduced to the commander of a ship who has hitherto contemplated the last six hours of his voyage, or necessitated *retreating* to the west coast of England, as the most anxious and *hazardous of the whole?** Often, alas! as the Burbo and north banks in Liverpool Bay bear frightful evidence—the last six hours of his hardy existence.

A Refuge presented.

HERE, then, my experience and efforts glow with satisfaction, whilst dedicating myself, as far as other similar engagements will permit, to the carrying out the spirited (I should say patriotic) views of the supporters of this new-port enterprise, presenting, as it does, the long and devoutly-desired boon to life and property,—A REFUGE. Yes; when crippled, and driven by westerly or north-westerly gales, you can even now, whilst the great progressive improvements are in hand, find shelter and safety for 18-feet draft at half tide, any where up the two-mile reach, at a jump, as it were, from ocean water; but if of 12-feet draft, at first-quarter flood in low-water neaps; in either case you are in excellent holding-ground, perfectly sheltered from sea, and out of tidal stream if the wind is S.W. or southerly, by anchoring close to the northern margin of North Wharf, any where within 1 mile of the outer lighthouse, not bringing it eastward of E. by S.½S. If, however, the wind is northward of W. round the lighthouse-buoy *close to*, and directly the lighthouse comes in one with Walney Light, or

Anticipated circumstances.

Off-hand directions.

* Little does the merchant think of this in his calculations, when stopping the insurance on learning his cargo is off Point Lynas. Why, 'tis *then* the *risk commences!*

bears N.N.W. *bring up*, slipping at tide time for the mooring berth off Fleetwood.

If not too early for tide in respect to your draft of water, then *run up at once*, for, as you will have perceived *before* this, it is a mere routine of A B C. Easy to the very letter.

H. M. DENHAM.

January 31, 1840.

A

BRIEF ACCOUNT OF THE LOCALITY, &c.

OF

PORT FLEETWOOD.

The Commission constituting 'PORT FLEETWOOD'; the Act of Parliament consolidating its *Harbour, Railway, and Dock* interests; the Sub-commission of *Pilotage;* the completion and opening of its *Custom-house,* Bonding-warehouses, and Yards; the erection of its first Lighthouse; the plans for immediate and progressive Harbour Improvements; and the fixing of time (July, 1840) for opening its Railway connexion with Preston,—all bearing the very recent date of 1839,—suggests the propriety of offering some *account* of it, in anticipation of the natural question of *Where is* this said New Port? To the mariner it will be enough to reply,—why, it is your old acquaintance, *Wyre Harbour!* But, to the general inquirer, a few particulars may be acceptable respecting its locality; relative position with other ports on the western coast of England and Irish Channel; its present capacity, capabilities, railway connexion with the manufacturing districts; and prospects in reference to the statistical data.

The river Wyre first assumes a river character near Bleasdale Forest, in Lancashire, and, after crossing the line of road between Preston and Lancaster, at Garstang, descends, as a tortuous stream, for five miles westward; then, in another five-mile reach, of ¼ of a mile wide, north-westward, sweeping the bight of Skippool, near *Poulton-le-Fylde*, on its way, and bursting forth from the Narrows, at *Wardless*, upon a north trend, into the tidal estuary which embraces an area of three miles by two, producing a combined reflux of back-water, equal to fifty million cubical yards, and dipping with such powerful *under-scour* during the first half-ebb, as to preserve a natural basin just within its coast-line orifice, capable of riding ships of 18 or 20 feet draft, at *low-water spring tides;* perfectly sheltered from all winds, and within a cable's length of the railway terminus, 19 miles from Preston, and in connexion with Manchester, Lancaster, Liverpool, and London. It is on the western margin of this natural dock that the town, wharfs, warehouses, and docks, are rising into notice, under the privileges of a distinct port, and abreast of which, the shores aptly narrow the *back-water escape* into a bottle-neck strait of but ⅛ the width of the estuary, so impelling it down a two-mile channel, as scarcely to permit diminishment of its 3 and 4-mile velocity until actually blended with the *cross-set* of the Lune and Morecambe Bay ebb waters. Thus, the original short course of Wyre, to open sea, is freed from the usual river deposit, its silting matter being kept in *suspension* until transferred and hurried forth at right angles by the ocean stream. It is, therefore, the peculiar feature and fortune of Wyre that, instead of a *bar* intervening between its bed or exit trough and open sea, a *precipitous* river shelf, equal to a fall of 47 feet in ¼ of a mile, the permanency of which is not only promised upon the principle of its tidal action and tenacious nature of its marly margin and trough, but by reference to the recorded state of Wyre Water and ancient-charted feature. Hitherto, however, the powerful self-clearing course of this seaward arm of Wyre has been left to nature's simple purpose, a vent or trough for mountain streams and valley scour, swollen in disgorge by tidal rise of 30 feet; upon the lift of which, however, many a timber and flax-laden ship has been borne to the realising of opulence, well remembered and testified at this day, amongst the manufacturers of canvas and cordage, who followed up the demand at Liverpool. But to avail of the general powers and *capabilities* of this haven and estuary, needed

only to be *mooted*, to be *determined upon*. Its locality, its relative position, and the conviction from statistical results, gave life to a *railway* connexion; and the plans I proposed for adapting its waters to the vast commercial projects, were at once approved and confided to my carrying out. Had the object been merely a *day-light* navigation, little more would be necessary than to closely buoy off the sea-reach course of 2 miles, formed by nature, between 20 fathoms *without*, and 20 feet *within*. But in these days, when steamers ply across seas with as much punctuality as an inland mail, that place which is not accessible by *night* as well as day, in a tempest as well as moderate weather, must be supinely content to be classed as only *half* a port, and unworthy the national object of a refuge to the weather-driven mariner. The essence, therefore, of my proposition, hinged upon *night* intercourse, and that, too, in as simple an operation as the very short run deserved, viz:—a light at its actual outer and turning point of bank from sea; and then, two lights so placed in relative altitude and distance at the inner end of the channel, as to form a straight course right up. Like all rivers, though in a much less degree than usual, the short but natural journey of the Wyre was not straight, a stubborn protrusion or two here, and the more pervious margin there, caused deflection of current, and permitted swatchway escapes of, to nature, superabundant back water; with these I grappled: 150,000 cubical yards of sub-marine matter, and as many reared up into tidal embankment or check dams, require but systematic and judicious *lines of operation*, in reference to tidal action, to render such, now-a-days, subservient to steam dredging, pontooning, and tramming; and so satisfactory is the first six month's progress, that in July next, a line of night access, direct from sea, of scarcely two mile extent, is intended to be opened, and guided by two bright shore lights, in *upper and lower* order, from columns of 90 and 30 feet altitude, so distanced from each other as to act, in the channel, sensitively enough to detect the slightest yaw in your steerage. This line of first improvements will admit vessels of 9 feet draft at low-water neaps or two hours' flood, on springs, and 14 feet at half tide; whilst, at the same periods, by *day* beaconage, you will have, as at present, 14 feet low-water neaps, and 12 feet at 1 hour's flood on springs. The progressive operations, however, will produce an uniform depth upon the one course of south in, and north out, with line of lights by night, or light

towers by day, of 12 feet at low-water springs. The hourly increase to this minimum capacity *will be obvious to those who reflect on the rise of tide*, viz: 30 feet at equinoctial seasons, 26 and 27 on ordinary springs, and 21 feet upon neaps, which can be ascertained *half hourly*, by reference to the annexed tide-table; whilst the approaching mariner is apprised of 9 feet existing over the shoalest part right up, or of 12 feet anchorage, abreast (east) of Outer Lighthouse, by the exhibition of a ball at that* and the Middle Lighthouse, or at night, during the time the two shore lights are exhibited. In these indications of depths, little reference need be made by the mariner to *send of sea*, as the shallows are, up the channel, beyond the reach of swell; in fact, the whole reach is as smooth as a mill-pond, until half-flood, when 14 feet rise is afforded (19 over all) and 5 fathoms in the anchorage 'Canshe Hole,' off the Custom-house.

H. M. DENHAM.

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*Two balls at the Outer Lighthouse indicate 12 feet water right up.

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J. and J. Mawdsley, Printers, Castle-street, Liverpool.